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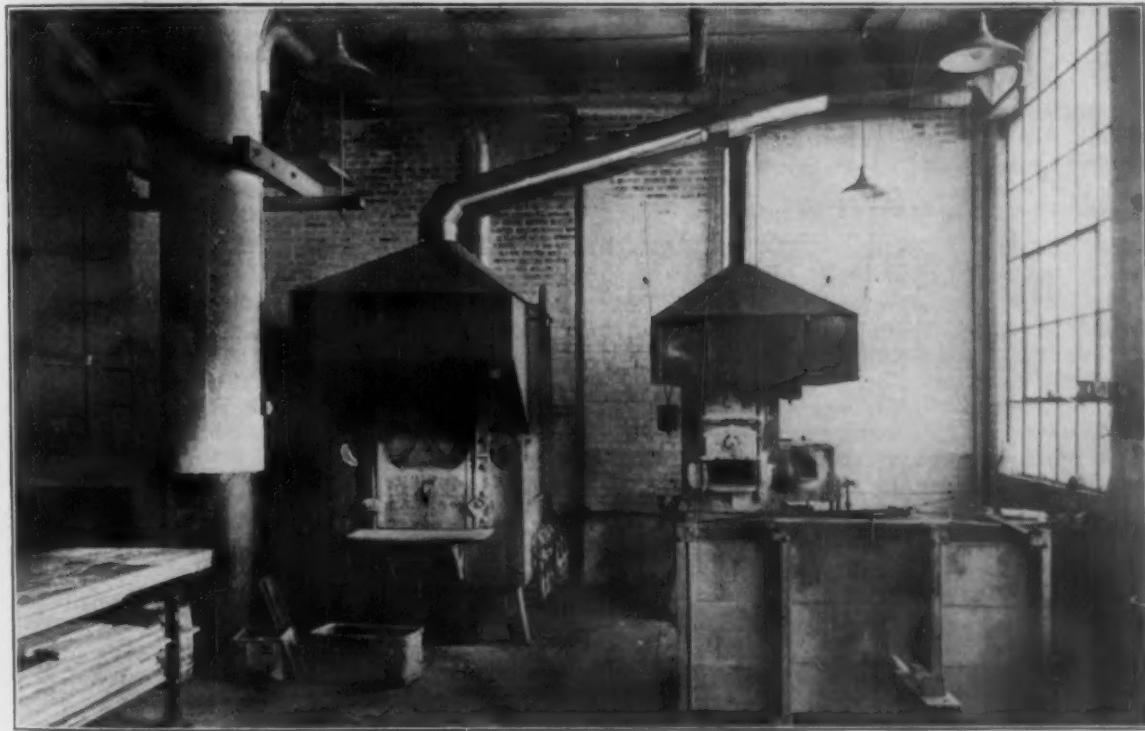
Manufacturing Methods Used in Toolroom

Automobile Jigs and Fixtures Produced
Largely by Machine Operators at Enterprise
Tool Company Instead of by Tool Makers

A N example of a modern toolroom and a simple system for routing work in that connection are found in the plant of the Enterprise Tool Company, Cleveland. The plant, which was placed in operation recently, is equipped for large production, and manufacturing methods are made to apply as far as the output permits. The principal prod-

on one type of machine all the time. In addition, the time that it takes the tool maker to get his tools and carry them to the machine is saved.

The plant is located in the new Power building of the Properties Company on East Seventy-second Street and occupies 16,000 sq. ft. of space somewhat irregular in shape on the ground floor. Duplicate



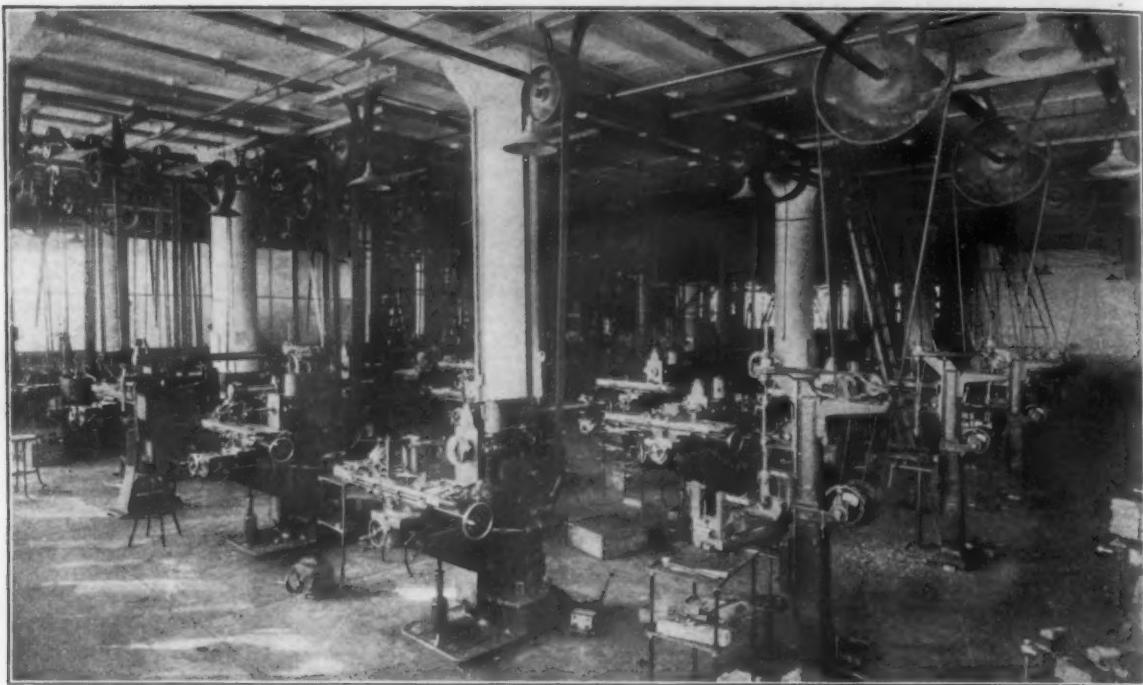
The Furnaces in the Heat-Treating Department Have Hoods Provided with a Forced Draft for Carrying Off the Heat and the Fumes

ucts are jigs and fixtures, but they also include anything in the line of tools, gages and small special machinery. However the plant specializes on jigs and fixtures for automobile builders.

It is the usual practice in toolrooms to have the work done from start to finish by tool makers. In the Enterprise plant the tool makers are kept off the machines as much as possible and practically all machine work and grinding is done by machine operators. This leaves only the finishing work and assembling to be done by the tool maker. This plan, it is stated, results in more economical production, for the reason that the wages of the machine operators are lower than those of the tool makers and as a rule the operators are speedier because they work

floor space has been leased on the second floor and will be used when required. The building is an up-to-date type of structure for factory purposes, being of steel and concrete and with a large amount of window space in steel sash.

The machinery is grouped together both according to types and to sizes of machines, the smaller machines being in the front part of the shop and the larger ones for the heavier work being in the rear. The machine-tool equipment includes 10 Brown & Sharpe milling machines in various sizes, 3 Cincinnati milling machines, 45 Hendey lathes, 2 Lucas boring mills, 13 Gould & Eberhardt shaping machines, 6 Henry & Wright sensitive drilling machines, 1 Gray planing machine, a 4-ft. American



The Machines Are Grouped According to Type and Size, This View Showing Some of the Milling and Drilling Machines and the Overhead Driving and Lighting Arrangements

radial drilling machine, 1 Leland-Gifford sensitive drilling machine and 4 Brown & Sharpe universal and 1 surface grinding machines. The machines are completely equipped with small tools, including micrometers, height gages, hardened squares, Swedish gages and hardened and ground parallels. The machinery is driven in groups from lineshafts by four 15-hp. motors located on interesting types of brackets attached to the building columns. A bracket is formed by two strap iron bands placed around the column, these bands supporting an angle iron frame. The motor rests on a wooden platform placed on the frame. In one case a double bracket is provided for supporting a motor on either side of the column.

The heat-treating department is equipped with two Frankfort gas-fired furnaces, one a large unit for case hardening and annealing and the other a combination heat treating one with a preheating oven over the heating oven and a lead pot on one side. To this equipment a hardening furnace will be added shortly. Connected to both furnaces is a Wilson-Maeulen pyrometer. Air blast for the furnaces is supplied by a Roots positive pressure blower located on a bracket on a building column and driven from the lineshaft through a countershaft. Hoods are provided over the furnaces for carrying off heat and fumes. These are connected to draft pipes that join and have a single outlet at the side of the building. To secure sufficient draft without erecting a stack to the top of the building a 2-in. branch is run from the main air line that supplies the blast for the furnaces to the draft pipe and the current of air thus supplied answers the purpose for which it is intended. A damper is located in this branch pipe to regulate the draft.

The workmen's benches are 30 in. wide and made of $\frac{7}{8}$ x 2-in. hard maple with a 2 x 12-in. plank along the front and have pressed steel legs. A drawer is provided under each vise. Each bench workman has an individual electric lamp supported in a universal lamp bracket built by the McCrosky Reamer Company, Meadville, Pa. The wiring is carried in steel conduits that are provided with sockets back of the benches. The sockets also furnish connections for portable electric tools that are used

when needed for fine work. The lamps are kept in the tool crib when not needed and are taken out on a workman's check. Overhead lighting is provided throughout the plant. This is supplied by four 100-watt lamps on 10-ft. centers in each 20 x 20-ft. bay. Plugs in the building columns furnish connections for individual lamps when required. The lighting is controlled from two lighting cabinets provided with push buttons, this method being regarded as fool proof as compared with the ordinary knife switch.

When an order is sent to the shop, the shop clerk makes out an order for stock which is sent to the rough stock department. Here the stock is put in tote pans with a tag on each pan and piece indicating the date, order and part number, name of tool or description of work, number of pieces and material. The drawings also accompany the work. The pans are delivered to racks located near the foreman's desk and the work is routed from there to the different machines. When an operation is completed the part is returned to the pan at the foreman's desk and another man takes it from there for the next operation. The work is carried from the tote boxes to the machines in single pieces, or in small pans, if one workman is to perform similar operations on several parts. Near the foreman's desk is a blackboard for entering rush orders that are given preference over other work. The blackboard is marked off in columns for date of delivery and order number.

The tool crib, located in the center of the shop, occupies one 20 x 20-ft. bay. This has the usual wire screen inclosure and for convenience has three windows. All racks and drawers are of metal, and in addition to an excellent arrangement for convenience and utilizing space, a fireproof safe is provided for holding the most expensive tools. The tool crib equipment was furnished by the Lyon Metallic Company.

The stock record for raw stock and small tools such as drills, reamers, taps, etc., is entered on 5 x 8-in. cards that are kept on file in the office, a separate card being provided for each item. This card contains the names of manufacturers and jobbers

able to furnish that particular stock, the date and quantity of the order, name of seller, date of delivery, etc. Other cards kept in the shop contain a record of the quantity taken from stock.

All shop time is noted on either productive or non-productive orders. Non-productive orders are classified under repairing machinery and shafting, repair and care of building, making small tools, often for some particular job but which can be used for various work in the shop, and other non-productive work not covered by these three classifications, the last including sharpening and repairing of tools. Productive orders are numbered and bear the symbol "M." Non-productive orders bear a distinguishing symbol for each class of non-productive work.

Each workman is provided with 15 tool checks bearing a number which corresponds to his clock and locker number. These he turns into the tool crib as he takes tools for each job. He is also given a permanent requisition for such tools as he uses constantly and oil cans, files, etc. When these wear out he secures a replacement order which permits him to take new tools.

Rapid Determination of Phosphorus in High-Speed Steels

An accurate and rapid modified method for the determination of phosphorus in high-speed steels is highly recommended by Edward C. Kraus, chemist, Atlas Steel Company, Dunkirk, N. Y. Excellent results are reported on Government standards containing various amounts of tungsten and vanadium. His method is as follows:

"Dissolve two grams of the sample in 1 to 3 aqua regia, and when the solution is boiling quietly add a few crystals of potassium chlorate. Evaporate to about 20 c.c. Then remove from the hot plate, add 40 c.c. of water, cool under tap and filter, washing twice with 1 to 1 HCl. Next, evaporate the solution to the basic ring. Again remove from the plate, wash down the sides of the beaker with about 25 c.c. of water, cool and filter. Transfer the solution to an Erlenmeyer flask and after neutralizing with 10 c.c. of ammonia and adding 15 c.c. of nitric acid, precipitate immediately with molybdate solution. If vanadium is present reduce with 5 c.c. of 8 per cent sulphurous acid just before adding the molybdate. Allow the solution to stand 45 minutes after thoroughly shaking. Then filter and determine the phosphorus by titration with standard acid and alkali solutions."

New Universal Type Grinding Machine

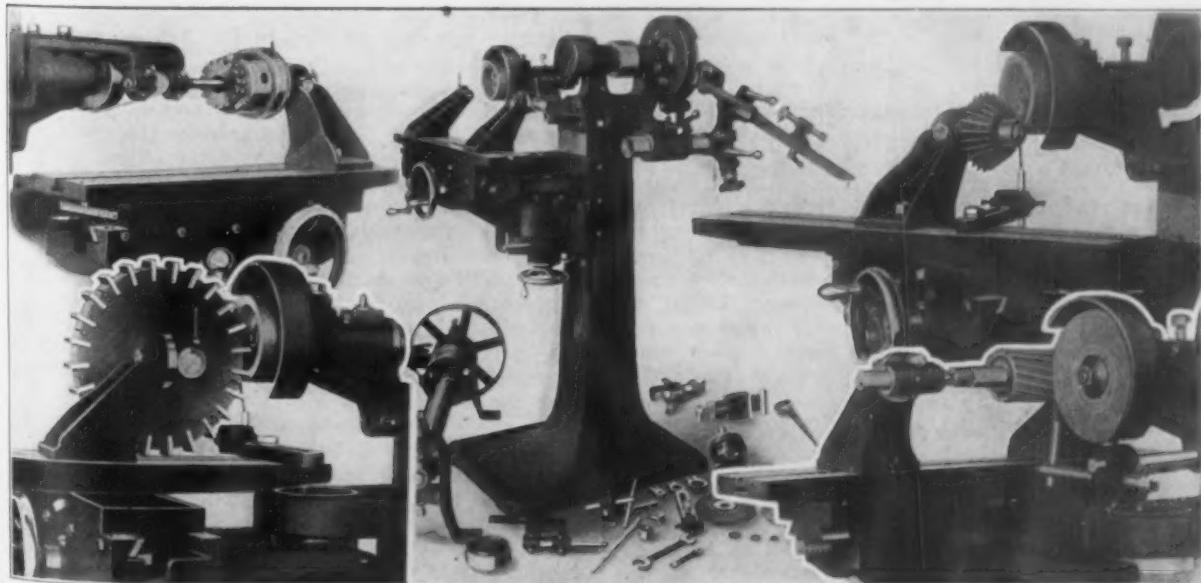
The Grand Rapids Grinding Machine Company, Grand Rapids, Mich., has brought out a new universal grinding machine. It is designed for handling cutters, drills and tools of all kinds, special emphasis being laid upon the fact that it is a universal machine for handling all classes of tool grinding, rather than a machine intended for one kind with attachments adapting it for the others. Features of construction include the swiveling of the table through a complete circle with ready provision for locking at any point, ability to grind fine tapers, and ease of manipulation.

A double-spindle construction is employed to give the high speeds required by the small wheels employed for sharpening cutters and reamers, as well as the slower ones for the larger wheels used in sharpening drills. This arrangement is secured by employing a cloth pinion on the cutter grinding spindle. Both spindles are mounted in large bronze bearings equipped with ring oiling devices and means for taking up either radial wear or end play. The table will swivel through a complete circle and is locked to the sub-table, which in turn is fastened in the desired position by two screws, one in front and one in back of the sub-table. To provide a lever action, which it is explained is sometimes desirable for certain classes of grinding work, an auxiliary lever is furnished that can be mounted on the handwheel controlling the longitudinal movement. This is done by simply slipping the lever over the wheel and fastening it in place by a thumb screw.

The headstock has slots in both directions, thus enabling it to be placed in line with or at right angles to the table. The vise, which is carried on the headstock, can be mounted in either position and in addition can be swiveled to present the work to the wheel in either horizontal, vertical or angular positions. The screws controlling the vertical and cross feeds operate in bronze nuts and have dials graduated to read to 0.001 in. A scale for tapers reading to 1/16 in. per ft. is also provided.

The cutter grinding portion of the machine will handle cutters, reamers or tools where the swing does not exceed 9 1/2 in. and the length is under 20 in. It will grind face mills up to 12 in. in diameter and internal work from 1/8 in. in diameter to 3 1/2 in. in depth. A transverse movement of 7 in. is provided, while the longitudinal and vertical movements are 15 and 6 1/2 in. respectively.

The drill holder will accommodate drills from 1/8 to 2 1/2 in. in diameter, a single standard holder, it is pointed out, providing for any desired angle of point, clearance or type of shank, even though the latter be larger than the diameter of the drill. Two, three or four lip drills of any size can be handled. Mechanism for truing the grinding face of the wheel is provided.



The Table of This New Universal Grinding Machine for Cutters, Drills and Tools of Various Kinds Can Be Set at Right Angles to or Parallel with the Grinding Wheel Spindle or at any Intermediate Angle and Locked in Position by Manipulating Two Screws

The Supply of Acid Bessemer Ore

A Survey of the Known Low Phosphorus Ore Deposits of the World—Supply Expected to Last from 50 to 100 Years

BY H. H. CAMPBELL

IN 1876, or soon after the Bessemer process had shown its worth, Abram S. Hewitt, then president of the American Institute of Mining Engineers, in a remarkable address foretold with almost mathematical exactness the growth of the iron industry. There were even then farsighted men who realized that the known deposits of low phosphorus ore could not furnish sufficient raw material for the needs of the world; while on the other hand there were optimists who predicted that new bodies of ore would virtually spring up from the ground. Ever since then men have been searching for iron ore in every corner of the earth; but very few beds have been found that will give an iron suitable for the acid converter. Meanwhile basic processes have been developed and we no longer are dependent on pure mineral; but even to-day we find that as much as one-quarter of all the steel produced in the world is made by acid processes and it may not be uninteresting to survey the sources of our low phosphorus ores. The writer of this article will try to point out how much ore of this kind is being mined in the world to-day, and for convenience the figures will be translated into "equivalent pig iron," for that is what we really want to know.

Bessemer Ore Produced in the United States

It is not easy to get accurate figures regarding the actual output of Bessemer ore in our country, for there are many mines that produce both Bessemer and non-Bessemer, while the dividing line between these grades is purely arbitrary. We have, however, an approximately accurate measure in the quantity of Bessemer pig iron produced, and as just said it is better to talk about pig iron than about ore. In 1915 the output of Bessemer pig iron in the United States was 10,523,000 tons, about 3 per cent being made in Colorado, about 2 per cent from the magnetites of Cornwall, Pa., and 4 per cent from imported mineral, mainly from Cuba; but 90 per cent came from Lake Superior ore.

This Lake district turns out half the Bessemer ore of the world; but we must keep in mind that a large part of it would not be considered up to the standard in Great Britain, where 0.08 per cent of phosphorus is the maximum allowed in acid steel. There has been an enormous increase in our output of iron ore from year to year, but the production of the purer grades is not increasing. Thus in the five years from 1903 to 1907 the output of Bessemer pig iron averaged 11,708,000 tons; from 1909 to 1913 the average was 10,893,000 tons; while in 1915 the production was 10,523,000 tons. The years 1908 and 1914 are omitted as abnormal. These figures indicate a slight decline in the output of Bessemer pig iron; and although from the standpoint of logic this does not prove that the ore reserves are decreasing, yet the average market price of Bessemer ore for the last 10 years has been more than 20 per cent higher than the price of non-Bessemer. Taking together the two facts—that pure ore commands a premium and that the output is not increasing—it would seem as if we were at the point where a greater output can be obtained only at a higher cost per unit, either through forcing production at existing mines or by opening inferior deposits.

ORE RESERVES IN THE UNITED STATES

No definite information can be given concerning the tonnage of Bessemer ore in the ground at Lake Superior, since in many districts, particularly on the Mesaba range, there is no order or system governing the distribution of the different kinds of ore. Moreover, the figures published, regarding the amount of all

kinds of ore that actually exist, are confusing, to say the least. Thus a few years ago, in a report to the International Geographical Congress at Stockholm, it was calculated that the Marquette range contained 110,000,000 tons of "available" ore. Now this field turns out about 4,000,000 tons per year, so that it would appear that the supply will be exhausted in less than 30 years; but incidentally it is stated that there are 15,900,000,000 tons of "potential" ore, and of course this will postpone a real catastrophe for 4000 years. Likewise it was shown that the Menominee and Gogebic ranges taken together have "available" ore enough for 25 years, but the "potential" supply will last 1700 years longer.

These figures apply to the whole mass of ore and do not give separately the reserves of Bessemer grade, so it is not possible to give accurate data on this point; but it is probable that about all the large deposits of rich low phosphorus ore in our country have been opened up and are now producing the maximum output consistent with economical operation. We may hope that they will last another quarter of a century at the present rate of production. Minor discoveries of new mineral areas may be looked for from time to time, while, as some of the mines give out, the market will be supplied with less desirable ores, lower in iron and higher in silica. Some time in the future, when the richer ores are gone, men will turn wholly to the leaner grades which are now hardly considered available. It is unnecessary to worry over the exact amount of mineral that falls below a certain arbitrary content of phosphorus, for there is an enormous amount of ore only a trifle outside the Bessemer limit, which will make metal suitable for the basic open hearth and for the duplex process.

Spain as a Producer of Bessemer Ore

Spain mines one-quarter of all the low phosphorus ore produced in the world, the output per year being equivalent to about 5,000,000 tons of pig iron, 90 per cent of this ore being exported. Half the shipments go to Great Britain and 40 per cent to Germany, the rest being divided between France, Belgium and the United States. The greater part of the ore comes from around Bilbao on the northern coast, and this carries about 50 per cent of iron in the natural state, with nearly or quite 10 per cent of silica. Considerable quantities of ore containing a small proportion of manganese are exported from southern Spain; and this is used in making low grade spiegeleisen, so it is not quite correct to speak of the total output as being equivalent to just so much "Bessemer pig iron"; but the error in so doing will not seriously affect the general problem of the world's supply of Bessemer ore, which is what we are considering.

From 1870, when Spain became an important source of iron ore, production increased until 1899, when 398,000 tons were mined. We cannot say that there has been a falling off since then, because in 1913 the record shows 9,862,000 tons; but in all the intervening time the average has been much less than it was 17 years ago. This leads us to believe that there may be some truth in the statement that the supply will give out in about a quarter of a century; but there is a little reluctance to accept the prediction as final on the part of those who were told the same thing more than 30 years ago. It is a fact, however, that poorer and poorer ores are shipped every year, and now large quantities of carbonate are exported which would not have been touched a generation ago. It will be a serious matter for both Great Britain and Germany when

the mines fail around Bilbao, for the imports from Spain form 60 per cent of all the low phosphorus ore used in the United Kingdom; and they also make up nine-tenths of all the pure ore smelted in Germany.

Great Britain's Bessemer Ore Deposits

The counties of Cumberland and Lancashire on the west coast of England contain nearly all the Bessemer ore in Great Britain; and this little district has made trouble for all the rest of the world, because the pig iron contains only 0.04 per cent of phosphorus, and the steel makers can fill specifications for acid Bessemer and acid open-hearth steel that other countries cannot meet. Production, however, has been decreasing for 30 years and the output of the English west coast today is equivalent to only 1,000,000 tons of pig iron per year, which is about 5 per cent of the total production of the world.

The output of Bessemer pig iron in Great Britain has been kept up and increased by the importations of ore from Spain and Algeria. If the day comes when England cannot get Bessemer ore, there will be quite a different situation from that in the United States; for about all the native supply of mineral in Great Britain gives a pig iron with considerably over 1 per cent of phosphorus, and there is nothing that resembles our non-Bessemer ore.

Other European Countries, Canada and Africa

There is a deposit of ore in Russia which goes by the name Krivoi Rog, and a portion of the field furnishes low phosphorus ore. Judging from incomplete reports, the production of pig iron within the Bessemer limit in phosphorus is about 750,000 tons per year, which is more than is made by any other country except the United States and Great Britain. It is stated that the good ore in the Krivoi Rog will run out in less than 30 years.

Norway has deposits of lean low-phosphorus magnetites which are estimated at 200,000,000 tons, and, as they run over 30 per cent in iron, they may supply the world with perhaps 70,000,000 tons of Bessemer pig iron. At present about 600,000 tons of concentrates per year are being produced, but in a year or two the capacity may be nearly 1,000,000 tons. Sweden produces an immense amount of ore, but the bulk of it is high in phosphorus, and this is true of most other countries. It is doubtful if the total output of Bessemer ore in Sweden, Germany, France, Belgium, Austria, Italy and Canada, all put together, represents as much as 1,000,000 tons of pig iron per year. French Africa, a term that includes Algeria and Tunis, exported enough ore in 1913 to make 900,000 tons of iron, but perhaps a quarter of this was non-Bessemer. Greece furnishes the equivalent of about 300,000 tons of Bessemer pig iron per year.

No figures are available concerning the reserve of ore in many countries. The report to the Swedish Congress, before referred to, deals with the subject from a geological rather than from a commercial standpoint; and while future generations may be interested in deep lying lean masses of ore, we want to know how much can be mined to meet present requirements regarding iron content and how much can be sold at a profit at prevailing market prices. Such information is lacking about Algeria, Greece, Russia and other countries; but it is fair to assume that mines that have been active for 30 years are turning out as much as they can economically produce, with a reasonable regard for a supply in the future. Assuming this to be true, we cannot expect that French Africa or Greece will make up any serious shortage of Bessemer ore when our present supply gives out.

Deposits in Cuba and South America

Cuba ships large quantities of mineral, but the greater part comes from the Mayari district, on the northern coast, in the neighborhood of Nipe Bay, and this contains chromium. The Bessemer ore comes from the southern coast, just east of Santiago, and the exports represent about 400,000 tons of pig iron per year. The ore occurs in rock that has been subject to extraordinary geologic upheavals and, in spite of the most

thorough explorations, it is not possible to see very far ahead; but it can safely be said that there will be no great increase in the output of Bessemer ore in Cuba. This, of course, has nothing to do with the supply from the chromiferous Mayari beds, which undoubtedly will immensely increase their output in the near future.

Within the last few years Chile has appeared on the scene as a producer of ore, much of which runs 68 per cent in iron, while it is very low in phosphorus; so that it ranks with the purest ores in the world. Complete surveys have not been made, but there are certainly 100,000,000 tons of rich ore in the Tofo mines, which are now being worked by the Bethlehem Steel Company. It remains to be seen whether this ore can be delivered at North Atlantic ports at a price which will make it attractive under present market conditions.

In the province of Minas Geraes, in Brazil, there are said to be nearly 6,000,000,000 tons of ore running over 50 per cent in iron, which is enough to supply all the blast furnaces of the world for about 50 years at the present rate of production. A part of this is within the Bessemer limit in phosphorus, but there are conflicting accounts as to the exact proportion of pure ore. The mines are 300 miles from Rio de Janeiro, and at an elevation of from 3000 to 5000 ft. Transportation charges are high, so that up to the present very little ore has been shipped either to Europe or to the United States. Some day there may be a double-track railroad to the mines and a fleet of special steamers on the ocean, with facilities for quick loading and unloading, similar to what we have on our Great Lakes, and then perhaps it will be possible to deliver the ore at reasonable prices at North Atlantic ports.

The General Situation

Making a summary of what has been stated, we can approximate the amount of pig iron represented by the low phosphorus ore mined in the world. Lake Superior produces the equivalent of 9,500,000 tons of pig iron per year; other parts of the United States, 1,000,000 tons; Spain, 5,000,000 tons; Great Britain, 1,000,000 tons; Russia, 750,000 tons; Norway, 400,000 tons; Greece, 300,000 tons; other parts of Europe and Canada, 1,000,000 tons; French Africa, 700,000 tons; Cuba, 400,000 tons; South America, India and other countries, 250,000 tons; making a total of a little over 20,000,000 tons.

In the United States we know the exact amount of Bessemer pig iron produced, but it seems that some countries in Europe do not classify their iron in the same way that we do. Hence, the above figures are based on the consumption of low phosphorus ore, and since a large amount is used for spiegeleisen and as additions in open-hearth furnaces, it follows that our figures are a little too high. However, we are not striving after mathematical accuracy, but only trying to form some sort of an idea as to how long our Bessemer ore will last.

Considering the impossibility of getting accurate figures regarding the amount of ore in the ground, and not knowing in some cases how much is Bessemer and how much non-Bessemer, the best we can do is to make a wild guess and say that there probably is sufficient acid Bessemer ore in the world to make about 1,500,000,000 tons of pig iron; and we must recognize a probable error of 33 per cent either way. As the output of Bessemer iron has been practically stationary for the last 10 years, it may be said that the supply will last from 50 to 100 years.

Use of Inferior Ore

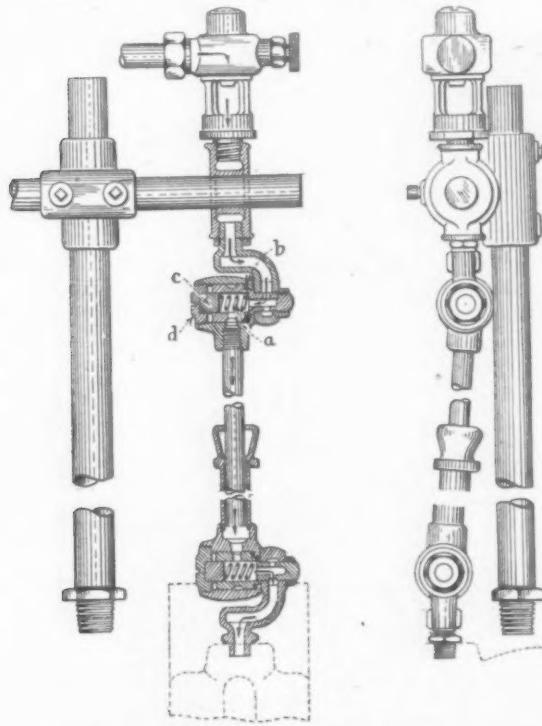
Everything depends, however, on whether the acid Bessemer is to be supplanted by the basic open hearth, for of course men will not dig up the last of the pure ore in Minnesota or Spain and will not open mines in Brazil when steel can be made cheaper from non-Bessemer Mesaba or from Minette ore. We need low phosphorus iron for ingot molds and for other purposes; but when the supply of rich ore runs out, there is a vast store of lean mineral which cannot profitably be worked to-day, but which can be used just as soon as low phosphorus iron commands a high premium. Even to-day we are using many different methods for the beneficiation of poor ores; they are roasted to remove

sulphur or carbonic acid, or simply to drive off water as in the case of the product of the Mayari beds in Cuba. Ore is hand picked, or washed, or concentrated by the magnet, and nodulized, or clinkered, or briquetted.

In the near future we will see more of this work done as the rich ores are exhausted; and there will come a time when it will pay to apply magnetic concentration to great masses of rock in the Eastern States, for pure rich concentrates will command a high price a century from now. There are large areas in northern New Jersey and throughout the Appalachians, where the rock mass carries from 10 to 20 per cent of iron in the form of small grains of magnetite. It is a simple matter to crush this rock, separate the mineral by a magnet and then nodulize the concentrates. Some day, perhaps, what we now know as standard Bessemer pig iron will have a fancy name and bring a high price, just as Swedish pig iron and charcoal blooms had a special niche in the market a generation ago. When that day comes the hills of New Jersey may be the seat of a great iron industry; but until this work can be done on a profit-making basis, these masses of rock will be just rock, and nothing more.

Cross-Head Telescopic Oiling Device

For feeding a stream of oil to eccentrics, cross-head pins or other moving parts, the Richardson-Phenix Company, Milwaukee, has brought out a line of telescopic oiling devices. The device is supported by an upright of 1 1/16-in. steel, which is screwed directly into the



Two Knuckle Joints Kept Oil Tight by Spiral Springs Characterize a Telescopic Device for Lubricating Cross-Heads and Other Reciprocating Engine Parts

engine frame, and a cross bar 5/8 in. in diameter which passes through a fitting on the upright. This arrangement provides for both horizontal and vertical adjustments of the oiler to suit the particular conditions of an installation. The oil is fed through the maker's sight feed at the top, which is connected directly to the oiling system, or if desired an oil cup mounted on top can be substituted. From the sight feed the oil passes down and around the fitting and in turn through the upper knuckle joint, the telescopic tubes of annealed steel and the lower knuckle joint and finally into the bearing. If desired, a piece of pipe can be employed for the upright.

The knuckle joints are bronze castings, and the spiral steel piano wire spring *a* holds the two halves of the joint against the composition washer *b*, which is inserted between the stationary and oscillating parts.

The outer end of the spring bears against a hardened steel pin *c* in the cap *d*. It is pointed out that the design of the joint is such that the bearing points of the spring are inside the fittings, where they are protected from dust and grit, and are constantly lubricated. The use of the spring is also relied upon to take up any wear which might occur, and thus keep the joints tight.

Book Review

Factory Accounting. By Frank E. Webner. Published by LaSalle Extension University, Chicago. Pages 341, 5 1/2 x 9 1/2 in.; charts, graphs and forms. Price \$3.30 postpaid.

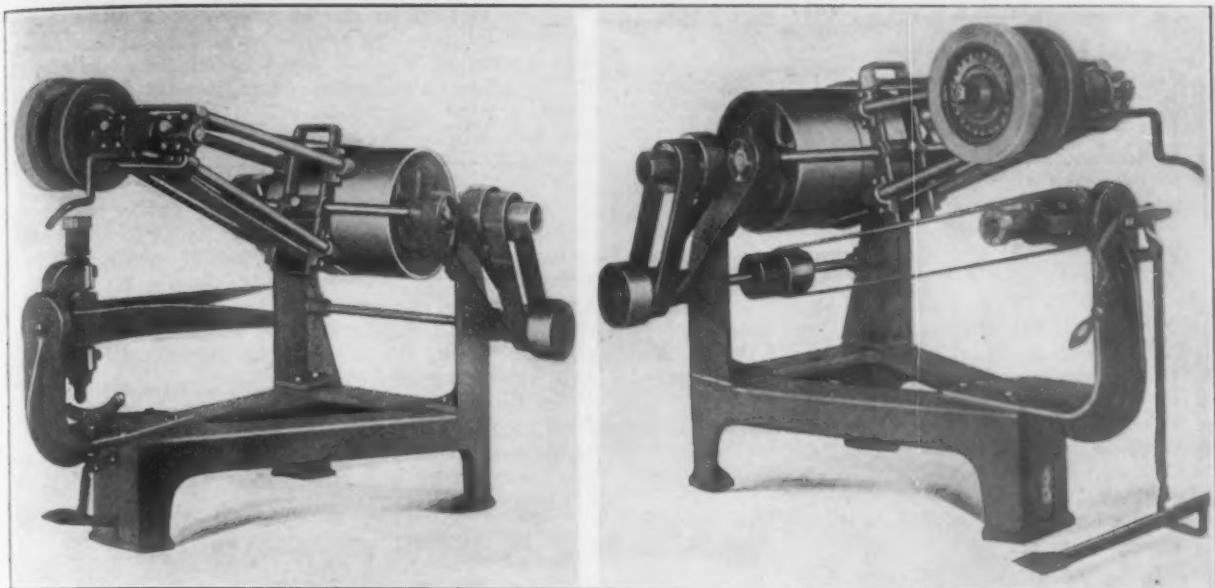
A vivid exposition of factory organization, methods and technique is offered in this most complete book by Mr. Webner, whose style of writing brings out clearly the weave of an intricate subject. The reader is attracted immediately by the first pictorial chart representing a hydraulic system which symbolizes the routing of production elements through the various phases of factory organization. The author looks beyond the narrow field of the individual producer to the latter's responsibility to industry and society as a whole. Socially minded men are coming to realize more and more the interdependency of all business, and the author refers to this broader outlook in the following statement: "When a producer stakes his chances of loss or profit upon a guess as to what his goods cost, he becomes a gambler. He jeopardizes not only his own interests, but also the interests of his competitors, who must strive to meet his frequently impossible prices, and the interests of the trade at large, which he is helping to demoralize by his 'unfair prices.' When he fails, the whole industrial fabric is affected by both the act and the record of failure, and he not infrequently carries down with him other institutions, entailing heavy loss upon hundreds and even thousands of people who did not even know that their interests were related to his."

The important factor, human element, is dealt with in the second chapter. "The greatest successes," the author says, "are achieved by those men who are endowed by nature with the happy faculty of picking able lieutenants to perform or oversee the details." Management can succeed only through the proper treatment of the man-power, for "every machine in the factory, every part of the product, every sale made, every dollar of investment depends for its efficiency on a man."

The statement, whether proved or not, of Edward N. Hurley, late chairman of the Federal Trade Commission, that less than 10 per cent of our producers know their own production cost or have any idea of the wastage, has done much to break down the old idea of secrecy in business management and has initiated plans of co-operation among manufacturers. In addition, an impetus has been given to the study of scientific factory accounting and has stimulated the writing of books like Mr. Webner's.

Following the development of a factory organization, the author deals successively with the control of records of accounts, with types and methods of production, and with the material, labor and expense of production. Each of these divisions is dealt with in detail, five plans, for instance, being described under overhead expense. The use of 84 illustrations makes the book a means of ready and practical reference.

The Seneca Wire & Mfg. Company, Fostoria, Ohio, through the efforts of its secretary and general manager, Lucian E. Kinn, has compiled tables of wire gages showing comparisons of the different gages used in the foreign countries and various markets. These tables are printed on cardboard in such a manner as to be most convenient for every-day use. They have been found almost indispensable by users of wire, and in view of their extreme usefulness the company has decided to furnish the tables to anyone interested upon application.



The Vertical Head Automatic Polishing and Buffing Machine at the Left Is Designed for Finishing Round Flat Surfaces, while the Horizontal One at the Right Takes Care of Cylindrical Work

A New Polishing and Buffing Machine

An automatic machine for polishing or buffing any style of circular or cylindrical work has been placed on the market by the Chase Turbine Mfg. Company, Orange, Mass. It is a universal machine and can also be employed for cylindrical, face, surface and angular polishing or buffing, thus, it is pointed out, adapting it for a large variety of work such as oval and square faced bells, electric light fixture canopies, cylindrical shaped metal bottles, cups, etc. The machine is built in two styles with vertical and horizontal work heads, which can be swiveled to bring the work into any desired position with relation to the wheels. It is also possible to revolve the work either with or against the wheel as desired, and automatic expansion chucks with a quick releasing feature are relied upon to give rapid production.

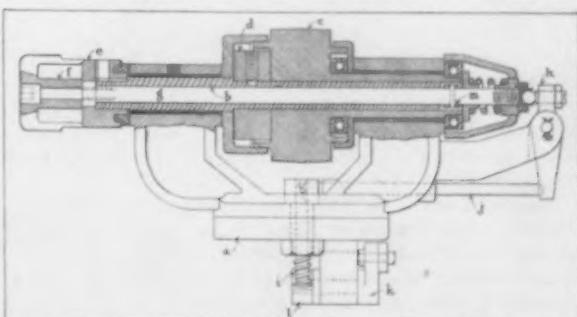
The vertical head machine at the left of the accompanying halftone is adapted for handling round flat surfaces, while the horizontal head machine at the right is employed for cylindrical work. The base and the submembers are separate castings, all parts being reinforced by heavy ribs where needed. The wheel spindle is made of steel $1\frac{1}{2}$ in. in diameter and is held in place in yoke boxes. Two wheel and three spacing collars are provided for the spindle to enable three wheels having a face width of 2 in. each to be mounted on the spindle at once. In this way, it is pointed out, a cutting, a polishing and a coloring wheel can be carried on the spindle at the same time, thus eliminating three handlings of the work by the operator, as when the work is once mounted in the chuck the three wheels are applied in quick succession and the work when removed is ready for the plater. The wheels are held firmly in place, it being emphasized that the only motion permitted is from left to right or in the opposite direction at the will of the operator.

The work head, details of which are given in the accompanying drawing, can be swiveled on its support to bring the work into any desired position with relation to the cutting wheels. The revolution of the work can be stopped by a movement of the foot treadle which applies the brake and also releases the automatic expanding chuck employed. The work head is supported by the bracket *a* and the spindle *b* extends entirely through the head. It is driven by the pulley *c*, which has a long hub running into the lower bearing. Normally the clutch member *d* is held in engagement with the clutch face of the pulley by the spring at the right. The housing surrounding the clutch serves as a brake and dust hood.

In the drawing a shell is being polished and is held

by the expanding chuck body *e*, which is expanded by *f*. The expander is fastened to the rod *g*, which extends through the spindle, by a hollow hexagon fillister head screw. The lever *h*, which is operated from the plunger *i* through the rod *j*, actuates the rod *g*. The plunger receives its motion from the foot treadle through a connecting rod and the levers *k* and *l*. When the treadle is operated the rod *g* is moved to the left, forcing the expander *f* out of the chuck body *e* and freeing the work. At the same time the collar *m* on the rod comes in contact with the bottom of the spindle *b* and carries the clutch *d* away from the pulley and against the clutch housing, thus stopping the spindle. The finished work is then replaced with a new piece and the foot removed from the treadle. The spring at the right draws in the rod *g*, thus expanding the chuck and pulling the clutch *d* against the pulley *c* and starting the spindle. If desired, a solid contractor and a split chuck can be substituted for the arrangement shown, thus enabling work that can be held by the outside to be finished.

The machine is driven from a countershaft or the main lineshaft by a belt connection to a pulley 10 in. in diameter with a 5-in. face. This pulley is regularly fitted to the left end of a $1\frac{7}{16}$ -in. shaft looking toward the machine. A sliding movement of 16 in. to the wheel spindle is provided by a drum pulley 18 in. in diameter with a 20-in. face. The lower shaft is driven by a three-step cone pulley ranging from 4 to 8 in. in diameter, the width of the steps being $2\frac{1}{2}$ in. The pulley employed for the work spindle drive is 6 in. in diameter with a 4-in. face. The power required for driving the machine is, of course, dependent upon the class of work handled, but under ordinary circumstances is between $2\frac{1}{2}$ and 10 hp.



The Work Being Finished Is Mounted on an Expanding Chuck Which Is Operated by a Rod Extending Entirely through the Spindle of the Work Holding Head

MASTER CATALOG FOR BUYERS

A Reference File Always Up to Date—Saving of Time and Money Effected

A standardized loose-leaf file is offered as a suggestion for the elimination of the waste in printed matter nowadays consigned to the waste basket by buyers. Desired material, it is contended, is buried in matter of no interest or is in awkward shape for filing. In describing the details of such an index, as outlined in a recent issue of *The Purchasing Agent*, the official organ of the National Association of Purchasing Agents, W. L. Chandler, assistant treasurer of the Dodge Sales & Engineering Company, Mishawaka, Ind., points out that it can be logically developed only through the cooperation of all national trade, engineering and other associations.

How such a catalog may become a practicable realization, he points out briefly as follows:

When a buyer shall need price lists or data pertaining to any material, he will turn to his single master catalog of loose-sheet variety, where he will expect to find full information supplied by various sellers. This information will include price lists, weights, freight rates, discounts, and any other data of value to the buyer. Failing to find sufficient information there, the buyer will consult his buyer's guide for the names of those who supply such material. The guide will indicate which of these sellers are prepared to supply sheets or booklets to fit his master catalog.

The loose sheets may be 8½ x 11 in. If one such sheet is too small to accommodate the requisite data, a book or booklet of those dimensions may be used, or a larger sheet—an exact multiple of this size—may be folded to this size.

These loose sheets are to be kept in standard vertical letter files of one or more drawers. These files are to be found in stock now in all large cities and are not limited to any one manufacturer. Being of standard letter size, economy of production is in its favor. Market reports and correspondence pertaining to the different price lists, such as quotations, discounts, or letters giving weights, freight rates or other data, being written on sheets of the same size as the catalog sheets, may and should be filed with the sheets to which they apply.

There is no limit to the possible expansion of such a master catalog. It may consist of one or a thousand drawers, depending upon the needs of its owner.

The conference board may recommend also a decimal system of indexing this catalog, somewhat along the lines of the Dewey system used by large libraries for indexing their thousands of books. By this system, a book in one library bears a number which is the same as those borne by all similar books in other libraries.

The index guide cards being standard, may be carried in stock by all office outfitters along with the cabinets. These may be bought, not necessarily in sets, but by the single piece, as requirements dictate. Thus the catalog will not be burdened with guides which do not interest the buyer, and yet, as the catalog expands to keep pace with the business, the guides when added will take their proper places in numerical decimal order.

A permanent joint catalog committee selected by the conference board, or the conference board itself, may, at regular intervals, publish additional decimal subdivisions of the index to keep pace with the development of the master catalog idea. Thus, it will be always up to date and of the greatest benefit to both buyer and seller.

Inasmuch as these letter files provide for the filing of letters with the right hand 11-in. edge uppermost, that edge then should carry a heading or some indication of the nature of the data to be found on the sheet. The seller's own interests will prompt him to see that these headings are brief but ample.

Colors for Information for Different Years

In addition to all this, the master catalog may be protected against becoming obsolete. The loose sheets

may be printed on colored paper, in addition to the date to indicate the year in which each was issued. For example: We will say that all sheets printed in 1917 shall be on white paper and bear the date of issue; those printed in 1918 on yellow paper, together with the date, while other colors may be used for 1919, 1920 and 1921. White will again be used for issues of 1922, and other colors repeated in regular order.

The color would serve to draw attention to the age of such sheets and lead to an inquiry as to their right to remain in the catalog. Upon advice that it is still in effect, it may be stamped by the buyer, "O.K. 19—," and left in the catalog. Such advices or inquiries from the buyers to the sellers would naturally result in the sellers notifying the buyers of the dependability of such data or sending new sheets.

In this way, it is possible to prevent the catalog from becoming obsolete. Such annual overhauling may be done by understudies, provided the discarded sheets are inspected by a competent person before being destroyed.

Covering Special Cases

On certain classes of material, it is altogether impracticable to depend upon data five years old. In cases of this kind, the particular sections of the catalog known to contain data pertaining to such material may be revised as often as judgment dictates. The colored sheets lend the same help in a revision of any frequency desired.

The principal advantage of the color scheme is that the catalog may be completely revised every five years at the longest, and parts or all of it revised as much oftener as is necessary or desirable.

In addition to printing price lists, etc., on colored sheets, it may prove advantageous to have the guide cards in colors to indicate those classes of material which are known to be subject to frequent fluctuations, thus requiring equally frequent revision of such portions of the catalog.

The use of this standard master catalog will not limit the quality of the information contained on the sheets or in the books, and will not in any way restrict advertising matter, except that which the seller desires to have the buyer retain in his file.

A great volume of advertising matter is now directed to those consumers who would have no interest in the master catalog. A manufacturer may issue a limited amount of data and price sheets for the master catalog of jobbers and large buyers. He would not in any way modify his larger use of advertising matter.

Under this plan, a seller's catalog may be printed on paper of a quality equal to that of any book now used for the purpose; the illustrations may be just as effective as desired, and the ink may be of any color or colors to best present the goods. The only restrictions would be as to the size of the sheets or books (thickness not restricted), and the issuance of separate sheets or books where one seller might handle goods of more than one classification.

The Waste of the Large Catalog

Some middlemen issue immense catalogs covering a wide range of material. These catalogs, costing large sums of money, are seldom used in their entirety by any one buyer. Small sections of such books would usually cover the needs of most of the buyers who now have the complete book.

Then, if such sections were filed under their proper index classifications in the master catalog, the buyer would be much more apt to consult them than if they were submerged in a large bound book as at present. The buyer's time and the seller's money would both be conserved.

In some cases, sellers may desire to send both bound volumes and master sheets or books to some of their largest customers. The master catalog does not interfere with such duplicate distribution on the part of the seller.

Until such time as the small buyers may equip to use the master catalog, it will be necessary to issue bound catalogs. It may always be necessary to do so.

However, when the seller knows that his loose sheets are going into the master catalog where the buyer will surely look for and as surely find them, he will cheerfully supply the sheets to those prepared to use them.

REHEATING HARDENED STEEL*

Effect of Time—Only Necessary to Heat Medium Steel Through 500 Degrees

BY C. R. HAYWARD AND S. S. RAYMOND

In reheating quenched steel to remove part of the hardness, the softening effect has generally been considered to be a function of temperature and time. The temperature effect is well known, and long before pyrometers were heard of the blacksmith was able to do a good job of tempering, by rule-of-thumb methods and experience in judging temperatures.

Modern conditions, which demand steel that will withstand the severest tests, require that the heat treatment be carried out with every possible precaution to secure the best results obtainable. Pyrometers and heat-treatment furnaces of many types are on the market and improvements are continually being made so that it is now possible to regulate the temperature in heat treatment very accurately.

There is still a question regarding the time that the steel should be subjected to treatment. It is customary with all operators to insure the desired temperature throughout the specimen and it is generally supposed that a longer treatment of a hardened steel produces a further softening but there are few published figures showing the exact effect of time of treatment at constant temperature. The present investigation had for its object the obtaining of some definite data regarding the effect of time, which might serve as a guide to those engaged in the heat treatment of steel.

The Steel Used

The steel furnished came from three rolled bars 13/16 in. in diameter, and was of the following composition:

Sample	Carbon, Per Cent	Silicon, Per Cent	Sulphur, Per Cent	Manganese, Per Cent	Phosphorus, Per Cent
C.....	0.45	0.03	0.049	0.056	0.016
D.....	0.45	0.03	0.048	0.053	0.017
F.....	0.44	0.03	0.049	0.053	0.013

The Furnace and Heat Treatment

The procedure decided upon was to heat all specimens to 800 deg. C. and reheat them in sets of three for 15 min., 30 min., 1 hr., 2 hr. and 4 hr. at 300, 400, 500 and 600 deg. C. The furnace used was made in the metallurgical laboratory of the Massachusetts Institute of Technology and has been described and illustrated in a previous paper.[†] The procedure in heat treatment was as follows: The furnace was heated to 800 deg. C. and nine specimens were introduced, which caused the temperature to fall to about 500 deg. C. When the temperature had again reached 800 deg., which took about 40 min., the current was regulated to hold the heat uniform for 5 min., after which the specimens were withdrawn and quenched in water. To insure uniformity in quenching, each specimen was dropped into a separate pail of tap water, the temperature of which was 4 deg. C. This procedure was continued until all the specimens had been hardened.

In the reheating operations, the furnace was brought to the desired temperature and nine specimens were introduced. This caused a fall in temperature and about 40 min. was required to bring it back to the desired point. When this was reached it was maintained for 1 hr., three specimens being removed after 15 min., three after 30 min. and the remaining three at the end of the hour. Six more specimens were then introduced and after the furnace had regained the desired temper-

*From a paper presented Feb. 21 at the annual meeting in New York City of the American Institute of Mining Engineers. Mr. Hayward is assistant professor of mining engineering and metallurgy, Massachusetts Institute of Technology. Mr. Raymond is a graduate student.

[†]Carle R. Hayward: "The Effect of Sulphur on Low-carbon Steel," Bulletin No. 118, p. 1841 (October, 1916). THE IRON AGE, Oct. 5, 1916.

ature the heat was kept uniform for 4 hr., three specimens being withdrawn after 2 hr. and the remaining three at the end of the 4-hr. period. When the specimens were removed, each was dropped into a pail of water at 4 deg. C. The above procedure was carried out for 300, 400, 500 and 600 deg. C.

After sawing a 1/2-in. length from the end of each piece for microscopic examination, the heat-treated specimens were turned into standard tensile specimens. A Berry strain gage was used for determining the elongation under increasing load, but because of the time required and the large number of specimens to be tested this instrument was used only on one specimen heated for 15 min. and one for 4 hr. at each temperature. In the remainder of the specimens the yield point was determined by the drop of the balance arm.

Discussion of the Results

The elastic limit as determined by the Berry gage is identical for the 15-min. and 4-hr. treatments at 300 and 400 deg. C. At 500 deg. C. the elastic limit of the 4-hr. specimen is about 10 per cent lower than the 15-min. specimen, and at 600 deg. the falling off is about 18 per cent.

The curves showing the breaking load and yield point are somewhat erratic. For some reason the breaking load in the 300 deg. specimens fell slightly up to 2 hr. and rose again after 4 hr. Since the yield point remained constant, it is probable that further tests would have shown that actually there is no falling off in tensile strength with increasing time of treatment. This would accord with the results obtained with the Berry gage for elastic limit.

In the 400-deg. specimens the ultimate strength remained constant while the yield point fell off about 5 per cent, as the time increased from 15 min. to 4 hr.

In the 500-deg. specimens there was a drop of about 8 per cent in the ultimate load as the time increased from 15 min. to 4 hr. The yield point fell about 5 per cent in 2 hr. and then for some unexplained reason rose again to about the original figure.

The 600-deg. specimens showed a gradual falling off in both ultimate load and yield point as the time increased. The total fall in the first case was about 6 per cent, and in the second about 3 per cent.

It is not fair to consider the question settled when only three specimens were used for each treatment, but the results obtained indicate that for reheating quenched medium carbon steel to temperatures below 500 deg. it is only necessary to heat it through. Longer heating has little or no effect on the tensile strength, ductility or hardness. At temperatures above 500 deg. increasing the time of treatment causes a slight falling off in hardness and tensile strength with a corresponding increase in ductility.

Although not intended as a part of this investigation, the curves plotted from some of the data show that for the 15-min. heating the ultimate strength falls about 25 per cent and the yield point about 20 per cent as the temperature increases from 300 to 600 deg., and the same figures hold approximately true for the 1/2-hr., 1-hr. and 2-hr. treatments. Heating for 4 hr. causes the ultimate strength to fall about 30 per cent and the yield point about 25 per cent as the temperature increases from 300 to 600 deg. C.

It is unfortunate that the heat capacity of the furnace used was so small that the introduction of the specimens caused such a large drop in temperature and a relatively long time in bringing it back to the desired point. However, in view of the fact that time was found to be of so little importance, it is not probable that the results were influenced appreciably by the time the specimens were in the furnace below the desired temperatures.

The Railway Motor Car Company, Hammond, Ind., capitalized at \$1,500,000, is building kerosene-burning motor cars for the use of railroad section men, by which such gangs will be greatly reduced in number. By mechanical means the men can tamp ties, drive spikes, splice rails, saw and drill holes in them, etc. It can be used to haul rails, ties and bridge timber. One man can put it on and take it off the rails. The company is also equipped to build small kerosene-burning locomotives and motor passenger cars. The factory site includes 15 acres, and there are five buildings. The company is capitalized at \$1,500,000. W. O. Worth is superintendent.

ANALYZING PRODUCER GAS*

Rapid Methods of Commercial Analysis and Sampling

THE engineer in charge of gas producers would frequently find a complete gas analysis of great practical value, but does not obtain one on account of the expense and difficulty. It is believed that the methods here recommended will be found to meet the requirements of those who are primarily engineers, rather than chemists.

A rather crude but ideally simple method of estimating the quality of the gas is to use a constantly burning test flame. It is almost universal practice to provide such a flame for the benefit of the producer operator. By its use, he can detect wide variations in the quality of the gas.

The purpose of the following discussions is to deal with the sampling and analysis of producer gas mainly from the practical standpoint. The aim is to describe

There are a number of methods which may be used for drawing the gas sample, the one in most common use being the so-called "two-bottle method."

When continuous samples extending over long periods are taken, using the ordinary two-bottle method, a number of errors occur aside from that due to the absorption and evolution of carbon dioxide by the water. It is evident that a correctly drawn sample should have the same composition as that which would be obtained by collecting in a gas holder and thoroughly mixing all of the gas which passes through the main in the given period. To get this result, when the flow of gas in the main is variable, the sample must be drawn continuously at a rate proportional to the rate of flow of the gas in the main.

A similar error occurs if the gas is sampled at a uniform rate while there is a large variation in the composition of the gas and its rate of flow through the main. If the changes in gas composition and the deviations from proportional sampling are not extreme, the error is not serious, and in cases where both the rate of gas flow and the rate of sampling

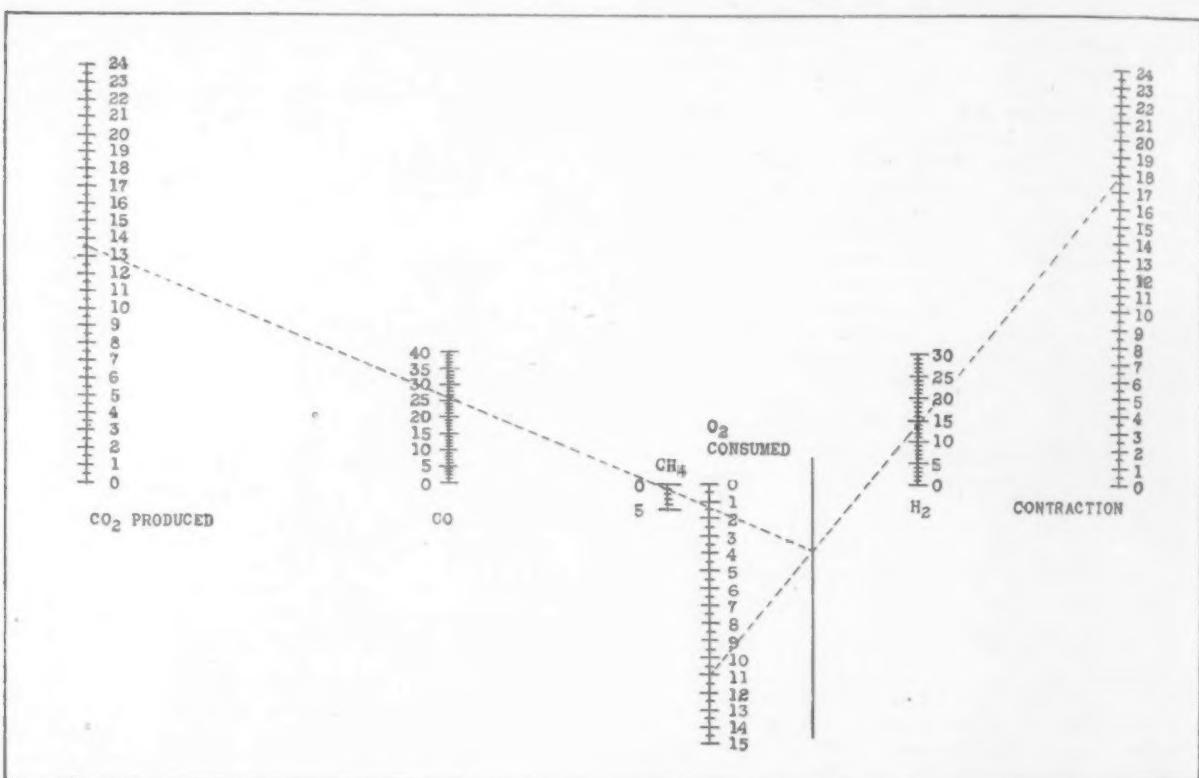


Diagram for Determination of Hydrogen, Carbon Monoxide and Methane in Producer Gas Analyses

methods which will give fairly accurate results in a simple and satisfactory manner.

Sampling

The sample of producer gas may be drawn directly from the gas main, or from a pipe through which there is a continuous flow of fresh gas from the main. The pipe may well be that which supplies the test flame. For a continuous sample, the pressure in the pipe should be practically constant at the point from which the sample is taken. The sampling connection will be at practically atmospheric pressure if it is located on the pipe supplying the test flame, at a point beyond the valve which regulates the flame.

If the gas is sampled after it has passed through the scrubber, it is so thoroughly mixed that an open-end sampling tube at the center of the main will draw a representative sample. Special sampling tubes with small holes would be particularly liable to become clogged, if used with unwashed gases, so that it would seem best to use the open-end sampling tube in such cases, placing it as far as possible from the producer to insure the maximum amount of mixing.

vary at random, the errors may add up or partly neutralize each other. The ordinary two-bottle method never gives an exactly correct sample, and that clogging of the thin tapering opening in the rubber tube between the bottles may produce a large error without being detected.

The writer has designed a device for the easy measurement and control of the rate of sampling. The connections of the upper bottle are the same as in the ordinary two-bottle method, but the water passes into the top of the lower bottle through an orifice flow meter. A thin copper disk, having a suitable small orifice, is clamped between the two halves of a union, so that the head of water which is producing the flow through this orifice can be measured on a manometer. The water in the manometer can easily be brought to any desired point by adjusting the pinch cock on the rubber tube connecting the bottles. The orifice, being made in a very thin plate, gives little trouble from clogging if clean water is used.

For sampling at a uniform rate, the water in the manometer tube can be brought to any mark and kept there by an occasional adjustment of the pinch cock. If it is desired to take a continuous proportional sample, it is necessary to have some form of flow meter in the gas main and a scale of rate of flow on

*From a paper by Philip W. Swain, Yale University, read at the annual meeting of the American Society of Mechanical Engineers, New York, Dec. 7, 1916.

the manometer. Since it is only necessary that the rate of flow of the water be proportional to the rate of flow of the gas in the main, it is immaterial what units of flow are used. Four scales of flow are used by the writer. These were laid out according to the law that the flow is proportional to the square root of the head.

Gas Analysis

In general, the engineer who is testing or operating gas producers desires to use a portable analysis apparatus which is rapid, reliable and easy to operate, and which will give each gas constituent correctly within 0.2 or 0.3 per cent of the total volume of gas.

For the complete analysis of producer gas, the ordinary Orsat apparatus is not sufficient; provision must be made for the determination of hydrogen, methane and illuminants (chiefly ethylene) in addition to the carbon dioxide, oxygen and carbon monoxide. There are now on the market for this purpose a number of portable instruments similar to the Orsat but with certain modifications and additions. In the Williams apparatus bubbling pipettes are used for all of the liquid reagents, which are as follows: 1, Caustic soda solution for carbon dioxide; 2, bromine water for illuminants; 3, phosphorus sticks for oxygen, and 4, an acid cuprous-chloride solution (containing copper strips) for carbon monoxide.

In the ordinary method of operation, the carbon dioxide, illuminants, oxygen and carbon monoxide are absorbed in this order, and the hydrogen and methane are then determined by explosion with air in the explosion burette. It is necessary to use a slight excess of air and to measure the contraction on explosion and the carbon dioxide produced by the explosion. The latter is determined by absorption in the first pipette. If the full amount of gas left after the absorption of carbon monoxide is used for the explosion, the following equations are employed.

$$\text{Methane} = \text{carbon dioxide produced}$$

$$\text{Hydrogen} = \frac{2}{3} \text{ contraction} - \frac{4}{3} \text{ carbon dioxide produced}$$

The method just described is the usual one for the analysis of producer gas with a portable apparatus, but it has certain disadvantages as follows: *a.* On account of the large amount of carbon monoxide in producer gas, the cuprous-chloride solution must be changed often. *b.* As the amount of methane present is small, the hydrogen content of the gas may be so low that the gas will not explode with air. In this case it becomes impossible to determine the hydrogen and methane by the ordinary method.

It is possible to eliminate the absorption of the carbon monoxide and to determine the carbon monoxide, hydrogen and methane by one explosion. This method does away with the troublesome cuprous-chloride solution and insures an explosion if the gas is combustible. This, however, requires the determination of the oxygen consumed as well as the contraction and the carbon dioxide produced. The absorption of the oxygen left over from the explosion is quicker than the absorption of carbon monoxide.

In the determination of carbon monoxide, hydrogen and methane by one explosion, it is necessary to measure: *a.* The contraction due to the explosion. *b.* The carbon dioxide produced by the explosion. *c.* The oxygen consumed in the explosion. The first two are determined as in the ordinary method where only the hydrogen and the methane are exploded. To determine the quantity of oxygen consumed, it is necessary to measure the amount of air taken in and to measure the excess of oxygen by means of the phosphorus pipette. For 100 cu. cm. of ordinary producer gas it is sufficient to use 124 cu. cm. of air (26.0 cu. cm. oxygen). With this amount of air the explosive mixture would have a total volume of more than 200 cu. cm. and could not be contained in the burette, so that it is necessary to reduce the volume of gas before explosion. For simplicity of calculation it is well to throw away exactly one-half of the volume of gas remaining after the absorption of the carbon dioxide, illuminants and oxygen, and then to take in 62 cu. cm. of air containing 13.0 cu. cm. of oxygen. If one-half

of the gas is used for explosion, the following equations give the per cent of hydrogen, carbon monoxide and methane in the original gas:

$$\text{Hydrogen} = 2 \text{ (contraction — oxygen consumed)}$$

$$\text{Carbon monoxide} = 2 \left(\frac{1}{3} \text{ contraction} + \frac{4}{3} \text{ carbon dioxide produced} \right) \text{ (oxygen consumed)}$$

$$\text{Methane} = 2 \left(\text{oxygen consumed} - \frac{1}{3} \text{ contraction} - \frac{1}{3} \text{ carbon dioxide produced} \right)$$

The accompanying diagram may be used for the solution of the equations involved for the determination of carbon monoxide, methane and hydrogen.

The dotted lines show the methods of using the diagram, but in ordinary solutions no lines need be drawn if use is made of a celluloid straight edge and a fine needle provided with a handle. The manipulation might be as follows: *a.* Place needle at contraction. *b.* Swing straight edge around needle to the oxygen consumed. *c.* Read hydrogen. *d.* Place needle at intersection of straight edge and blank. *e.* Swing straight edge around needle to carbon dioxide produced. *f.* Read carbon monoxide. *g.* Read methane.

Producer gas is often free from illuminants so that time may be saved by passing directly to the phosphorus pipette after the carbon dioxide has been determined. If any fumes appear, the absorption of oxygen can be continued. If fumes do not appear, the gas is passed into the pipette containing bromine water, and then into the carbon dioxide pipette to absorb the bromine fumes. The action is rapid, so that one pass through each pipette is sufficient.

Mixing Basic Slags with Native Magnesites

Mixing basic slags with magnesites to cause them to sinter satisfactorily is being practised in some localities. The process is said to make the non-sintering magnesites more nearly like Austrian magnesite. The Canadian magnesite from the Calumet district is stated to be not altogether ideal for making firebrick because it does not sinter on burning and its lime contents are rather high, frequently as much as 10 per cent. Experiments have been made to cause it to sinter by adding iron ore so as to produce a dense product suitable for furnace linings or for making brick.

H. J. Ross, of the North American Magnesite Company, Calumet, Quebec, is reported as stating that its magnesite has been used in large quantities for lining open-hearth furnaces, the burnt magnesite being mixed with basic slag as in the ordinary practice and that this has had the effect of causing it to sinter in the furnace. It has been possible, he says, to dispense with magnesite brick in these furnaces, as is indicated by the following instructions supplied by him:

The crude magnesite is partially burned, four or five hours, in an ordinary heating furnace, but if more convenient a cupola, or rotary kiln, or a continuous furnace may be used. Then draw and mix it thoroughly on the floor with 10 or 15 per cent of good basic slag. Put it in the bottom of an open-hearth furnace and treat it like Austrian magnesite.

This material has proved, where back walls are made for rolling or tilting furnaces, equal to any material ever used. One of the advantages of it is that the bottoms can be set in one-half the time required by the Austrian magnesite. The material has been in use in one plant for the last eight months where it could be compared with the Austrian magnesite, and with the disadvantage of having no magnesite brick. In this case the hearth was lined entirely up to the slag line with clay brick, and after this eight months' test the results were found to be fully equal to the Austrian magnesite. Exceptionally fine results are said to be obtained by using it for closing tap holes.

By arranging two electrodes which can be raised and lowered from a crane into a ladle, a method has been invented by C. A. Keller, of Paris, France, whereby the steel can be kept hot conveniently in the ladle when it is necessary to tap more than one furnace into one ladle. Current passing from one electrode to the other through the metal is claimed to generate enough heat to bring the contents back to the proper pouring temperature.

THE MANUFACTURE OF GAGES

Methods Used Abroad for Their Rapid Production for Making War Material

ONE of the problems which would confront the country in case of war would be the production of an enormous number of gages for shop use, for inspection and for checking. It has been estimated that under the present method of manufacture the services of all the tool makers in the country would be required for one year to make a sufficient number of gages for the manufacture of munitions for an army of a million men. In view of this fact the methods that have been adopted in Great Britain for the rapid manufacture of gages are of peculiar interest. Those used at the Paddington Technical Institute, London, were described in a paper by A. G. Cooke, W. J. Gow and W. G. Tunnicliffe, read before the Institution of Mechanical Engineers on Jan. 19.

The problem of making gages on the scale necessitated by war requirements is quite different from that of making them in a small shop where a high degree of

lathe used should be such that no divergency from the correct value greater than about $1\frac{1}{2}$ ten-thousandths should exist throughout the range used. For this would cause a skew surface otherwise cut in correct shape to the mean value to pass outside the limits allowed. If any further error in pitch exists, up to an extreme value of three ten-thousandths, it is only possible to keep within limits by thinning of threads, reducing the effective diameter, and the practical difficulties of the reduced margin increase rapidly if the above error is exceeded. The authors found that the lathes built by a number of manufacturers showed an error in pitch of about two in a thousand, always short of specification. This uniform or progressive error is fairly easily corrected by change of gear wheels, as will be shown, but indicates the need for standardization in lead screws. Superimposed on this error were periodic errors, initial and produced by wear, requiring measurement, analysis and correction. In a choice between methods of correction that which will permanently rectify a discovered cause of variation so as to bring it within the defined limits is preferable to any method of compensation which, though more capable of refinement, would allow

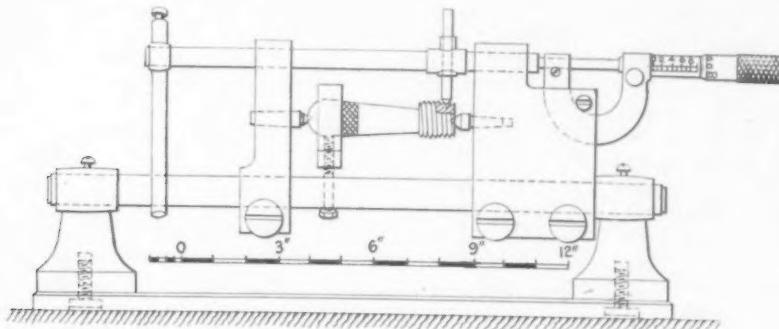


Fig. 1—Apparatus for Pitch Measurement

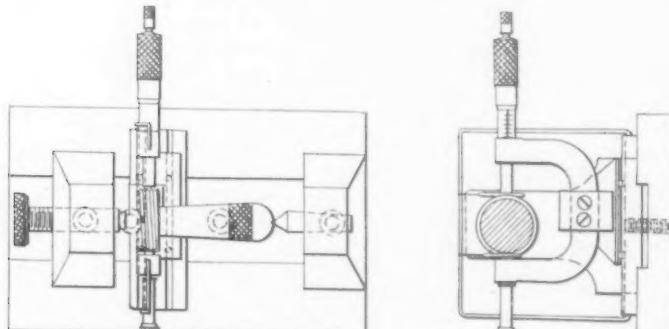


Fig. 2—Apparatus for Effective Diameter Measurement

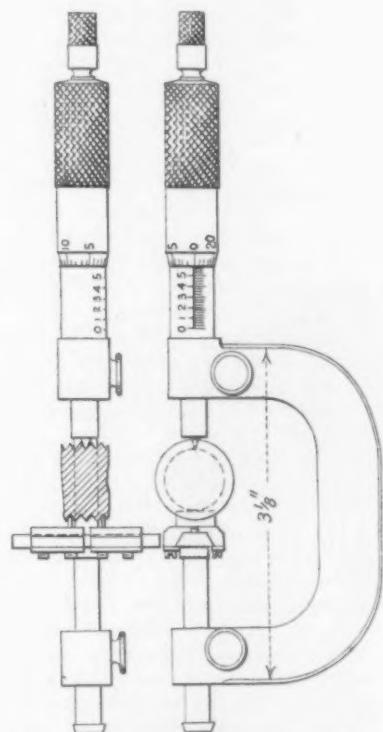


Fig. 3—Apparatus for Core Diameter Measurement

perfection can be attained by trial and error. The authors stated that when an industry grows to a national or international extent the standards must aim at specified dimensions of absolute magnitude, defining exactly the limits of permissible variation on either side of the standard so as to include all acceptable and reject all unacceptable variations from the correct value. "It is just in so far as we can rely on the accuracy of inspection gages to define the limits of variation permissible that the designer can allow those limits to be extended with safety. Hence the apparent paradox that high accuracy in the inspection gages allows more laxity, and so increases facility and speed of manufacture."

The authors selected for illustration the manufacture of screw gages, and the following is condensed from their description of the methods used.

Screw Gages

In screw gages the gaging surface is an elaborate skew surface, all parts of which are required to be within the limits, in general fixed at three ten-thousandths measured radially from the axis—0.0006 in diameter. This means only about $1\frac{1}{2}$ ten-thousandths normally to the slope of the threads.

It should be evident that the accuracy in pitch of the

redevelopment of error in prolonged heavy use, thus delaying output.

The periodic error is amenable to reduction by a final lapping process, but for this not only the amplitude but the length of the periods must be considered, and probably also the method of lapping. Short periods and lapsing with high speeds through several turns of the lap seemed necessary to success.

Workshop Measurements

It was found absolutely necessary to design and make for themselves instruments by which measurements of pitch and the diameters of the screw gages could be made on the premises, and optical apparatus by which screw-cutting tools could be shaped and the sections of the screw threads examined.

The apparatus for pitch measurement is shown in Fig. 1. By its use on test pieces they were enabled to analyze step by step the errors of pitch in lathes. One example will be given in some detail. The pin, which is moved from groove to groove, followed by micrometer, is turned to a cone of angle slightly less than 55 deg.*

*It should be remembered that the paper describes an apparatus used on screw threads made to the English or Whitworth standard, in which the angle of the thread is 55 deg.

and the point removed to insure that the pin touches, not the bottom, but the sides of the groove. Supreme care, by good fitting, is necessary to insure that the points of contact follow a line parallel to the axis of the screw.

The differences between the micrometer readings for

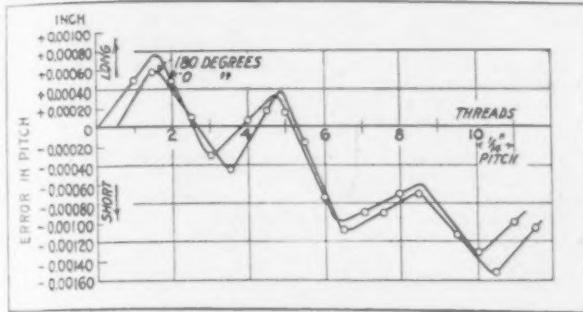


Fig. 4—Test Taken on Opposite Sides of a Test Piece of 14 Threads to the Inch, Lead Screw Pitch 4 Threads to the Inch

each groove and those calculated for a correct screw of the presumed pitch are plotted as ordinates in Figs. 4 and 5. These are selected from a large number of records as the first and final pitch diagrams of test pieces from the same lathe before and after correction. The test of Fig. 5 was taken on opposite sides of a test piece of fourteen threads to the inch, the lead screw pitch being presumed four threads to the inch. Analyzed it shows a fairly uniform progressive error of 0.0022 per inch, with superimposed periodic errors corresponding to the revolution of the lead screw, of amplitude 0.0004 in. The lathe was in good condition, fairly typical of ordinary workshop accuracy.

Two methods of correction for progressive error were considered:

(a) By accelerating the motion of the top slide of the compound rest by means of a weighted lever attached to the screw. The screw of the slide was turned at a uniform rate as the saddle traversed along the bed of the lathe, by making the end of the lever move down an inclined plane, the slope of which could be readily determined from the known pitch error.

(b) By selecting a new train of wheels, a process demanding considerable calculation by trial and error for different pitches, but which has proved quite possible in all cases. For example, the train of wheels, drivers 38 and 20, followers 91 and 50, gives a pitch of 24 to the inch correct to less than 0.000007.

The periodic errors corresponding to the revolution of the lead screw may be due to:

(1) Reproduction of an error in the lead screw.

(2) An axial movement of the lead screw with each rotation, owing to both the thrust collar and bearing being out of truth.

(3) Lack of straightness or stiffness in the lead screw causing oscillations at the point of contact of the nut.

To correct (2) the collar bearing on the lead screw was dispensed with, and the thrust was carried by a single ball bearing applied to an enlarged center on the

eccentricity it became evident that a more accurate and rigid lead screw was necessary. A new lead screw was cut on the milling machine on a sleeve of 2-in. diameter and 8 in. long, with a pitch intended to be 12 threads to the inch. A split nut 2½ in. long was clamped by a weighted lever. Mounted on the original lead screw as shaft a progressive error of 0.0008 was found with a periodic error amplitude nearly 0.0003. On substituting a short, stiff shaft the latter was reduced to an amount not exceeding 0.0002, which may be considered satisfactory. The progressive error was approximately corrected by the following gear wheels:

45 × 30 Drivers.

For 24 threads to the inch,

38 × 71 Followers.

36 × 67 Drivers.

For 14 threads to the inch,

74 × 38 Followers.

The final test showing a satisfactory range for a length of 1¼ in. is shown in Fig. 5. This length, carefully marked, was sufficient for the gages required.

The apparatus for effective diameter measurement is shown in Fig. 2. The micrometer carriage, mounted on balls, is constrained to move in a plane at right angles to the axis of the screw to be tested. The apparatus may also be used for measuring core diameter, by using triangular prisms in place of small cylinders.

An ordinary 0 to 2-in. micrometer, fitted with a special adjustable attachment to enable direct measurements to be made of core diameter, is shown in Fig. 3.

Optical Projection

Enlargement by optical projection was first resorted to for adjustment of the shape of the tools for screw cutting, and verification of the shape of thread. Finding the possibilities for accuracy of measurement were greater than was thought possible and well within the tolerance allowed, the use was extended to a large variety of gages, particularly to plate gages of shape, slots and holes, curvature and cone angles, etc.

The key to the method is to secure, as nearly as possible, a truly parallel beam of intense light, freed from heat rays by passage through a saturated solution of alum. An optical bench of great rigidity, and sensitive and universal adjustments, carries the gage or tool and projecting lenses. The screen is at a distance of about 16 ft.

A combination of three optical elements was designed to give variable magnification up to 400. About 180 is, however, ample, and visible in undarkened room. Where it was desired, as in a few cases, to cover a larger gage length than about ½ in., a triple achromatic lens of 2-in. diameter and 6-in. focus was combined with an astigmatic lens. The area surveyed on this extended up to over 1¼ in., with 50 magnifications on a 6-ft. screen. Quick interchange of gages and tools from optical bench to vise or lapping motor with the minimum of readjustment is essential.

Shaping of Screw Threads

With a magnification of 166 a clear definition of the working edge of the single-pointed tool for screw cutting is possible to much less than a ten-thousandth, this being represented by one-sixtieth on the screen. The angle and rounding off of the nose for the required pitch are adjusted with a fine oil stone to this degree of accuracy, after hardening without tempering, and quickly readjusted after wear. The same tool is used to cut the groove in a capping tool for the crests. It is then possible to insure correct shape, provided that the relation of core to effective diameter is checked by measurement.

In the final projection of the screw thread in silhouette a careful examination for symmetry is advisable, checking the setting of the tool. A small margin in all dimensions is left for lapping, which removes some residual errors, the margin being increased if a hardened gage is required. For rapid lapping the screw gage is held in a self-centering chuck on the shaft of a 1-hp. electric motor. This is automatically controlled by a reversing switch, so that it rotates with precision, uniform torque, and any desired speed, two revolutions forward and backward.

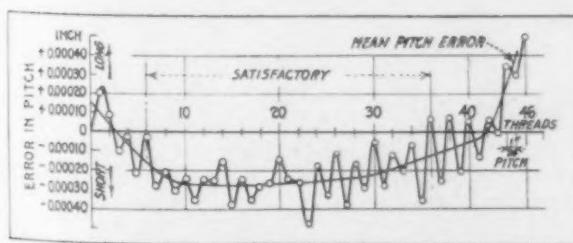


Fig. 5—Final Test on a Screw Showing a Satisfactory Range for a Length of 1¼ In.

lead screw. The collar was turned off and the screw made to run free in its bearing. A ½-in. ball was used, and the thrust taken by a bolt screwed through a bracket and locked in position, the end of the bolt being made intensely hard.

After testing and correcting the change wheels for

The laps are made of cast-iron, cut with a tap, or on lathe, split, and adjustable for wear. Frequent retapping retains the shape. For the core a lap is prepared with a slightly thin thread, and for effective diameter a full thread with crest removed.

TO OPPOSE METRIC SYSTEM

The American Institute of Weights and Measures Organized

The revival of the agitation for the adoption of the metric system after a dozen years of quiescence imposes on those directly interested a renewal of measures for the preservation of established standards. The voluminous literature which was the outgrowth of the last agitation is a mine of information but, with the passage of time, it has ceased to be readily accessible. In that literature it was demonstrated, almost to the point of weariness, that the complete adoption of the system is impossible, the only possible result of the attempt being a partial adoption. Such partial adoption or continued use of two systems side by side would lead to a complete nullification and reversal of metric claims (all of which are based on the assumption that the change is to be complete) and would result in a state of confusion which is common in so-called metric countries and scarcely capable of description.

It is to the manufacturer especially that this condition is serious. Standardized portions of his products cannot be changed while many others can be, and the making of some parts of a machine, even of some dimensions of single pieces, to one system and of others to another would result in a degree of confusion and disorder that can be imagined better than described. Examples of this practice are common in metric countries.

It is probably in the use of the metric system in engineering combined with manufacturing that the case is at its worst. All engineering construction makes use of standardized manufactures through the application of engineering formulas and tables. If the engineer is to use the metric system in connection with such standardized articles, our vast volume of engineering literature has no application and must be rewritten from the beginning to suit this condition. That is to say, the change involves either the sacrifice of existing standards to save the literature or the sacrifice of existing literature to save the standards. As a matter of physical fact, the standards cannot be changed and the literature will have to go, the final result being a hybrid system of English standards and metric applications.

In most discussions of the subject the commercial application of weight and measure—the buying and selling of commodities—is the only one considered and many advocates of the metric system fail to realize that there is any other. It is when the industrial and technical applications are considered that the danger of the compulsory introduction of the metric system looms largest.

Following their overwhelming victory of a dozen years ago, the opponents of the metric system went to sleep. Not so, however, with the metric partisans who have continued their publication of assumptions and misrepresentations while the public, to whom the extended investigations necessary to refute these false statements are impossible, has been misled and deceived. Last spring came the misleading report of Doctor Stratton, director of the National Bureau of Standards, on the metric system in export trade and with it the realization that he had at his command the use of the Government printing office at Washington for printing and of the facilities of the Post Office Department for distributing his literature—both without cost. Almost simultaneously came the knowledge of his metric engine, the annual conference of weight and measure officials, through which his doctrines are distributed throughout the country, while his berry basket bill and the Ashbrook bill illustrate the methods to which he is prepared to resort in foisting the system on the country.

Following these disclosures, the opposition awoke under the leadership of Henry D. Sharpe and several meetings were held with the result that the organization of a defense association was decided upon. The outgrowth has been the American Institute of Weights and Measures with the following declared objects:

The maintenance and improvement of our present (English) system of weights and measures, for the good of our commerce and industry and the well-being of our country.

The education of the people with respect to the importance of our weights and measures, through the dissemination of correct information with respect to them and to the danger in changes of our basic standards of measurement.

The improvement of old and the development of additional standards as they may be needed by reason of new conditions in commerce, industry, science and engineering.

The promotion of wise legislation for the conservation of our basic English units of weight and measure and opposition to hasty and ill-considered legislation involving changes from our fundamental English standards.

There are three grades of membership, namely, association, corporation and individual. The annual dues of association members are \$100 for associations which are national in scope and \$25 for all others. The annual dues of corporation members employing less than 500 employees are \$25 and of those employing more than 500 and less than 1000 employees \$50, then increase at the rate of \$25 for each additional 1000 employees or fraction thereof up to a maximum of \$500. The annual dues of individual members are \$5.

The members of the Council are: John F. Farrell, superintendent weights and measures of the State of New York; Fred A. Geier, president Cincinnati Milling Machine Company; E. M. Herr, president Westinghouse Electric & Mfg. Company; Alexander C. Humphreys, president Stevens Institute of Technology, past president American Society of Mechanical Engineers; W. R. Ingalls, editor *Engineering and Mining Journal*, president Mining and Metallurgical Society of America; D. H. Kelly, secretary Toledo Scale Company; Henry M. Leland, president Cadillac Motor Car Company, past president Society of Automobile Engineers; William Lodge, president Lodge & Shipley Machine Tool Company; Walter M. McFarland, Babcock & Wilcox Company; Henry D. Sharpe, treasurer Brown & Sharpe Mfg. Company; Stevenson Taylor, president American Bureau of Shipping, president Institute of Naval Architects and Marine Engineers; Charles N. Thorn, president Inter-Continental Machinery Corporation; Henry R. Towne, chairman of the board of the Yale & Towne Mfg. Company, past president American Society of Mechanical Engineers; W. H. Van Dervoort, president Root & Van Dervoort Engineering Company, president National Metal Trades Association; Worcester R. Warner, vice-president Warner & Swasey Company, past president American Society of Mechanical Engineers.

At a meeting of the Council at the Engineers' Club, New York, Feb. 19, the following officers were elected: President, W. R. Ingalls; vice-presidents, Henry D. Sharpe and D. H. Kelly; treasurer, Walter M. McFarland; commissioner and secretary, F. A. Halsey. The Institute will open offices in New York at once and will inaugurate an aggressive campaign. Applications for membership should be sent to F. A. Halsey, commissioner, Hill Building, Tenth Avenue and Thirty-sixth Street, New York.

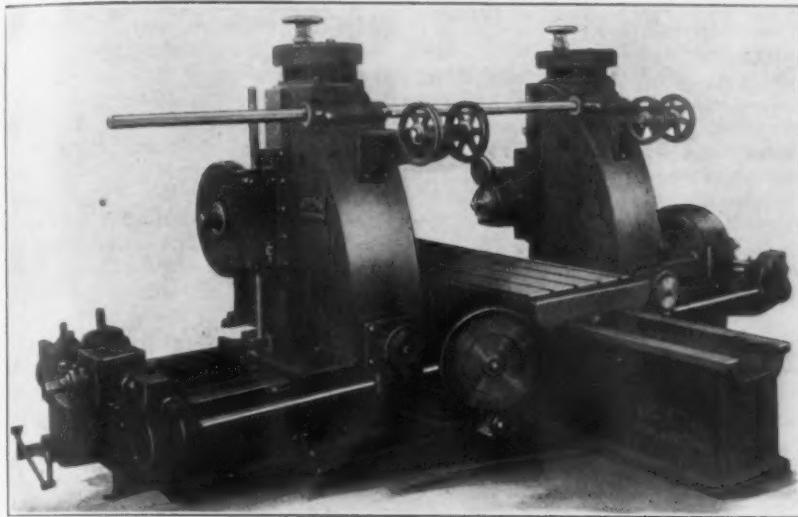
Standard Parts Buys Bock Bearing Company

The Standard Parts Company, Cleveland, recently organized by the consolidation of the Standard Welding Company and the Perfection Spring Company, has purchased control of the Bock Bearing Company, Toledo, Ohio, having obtained options on 80 per cent of the common stock at \$151.60 a share. The Bock Bearing Company has an outstanding capital stock of \$1,175,500 in common and \$450,000 preferred. It is stated that payment is to be made on the basis of one-third cash and one-third in preferred and one-third in common stock of the Standard Parts Company. William E. Bock, president Bock Bearing Company, will become a director in the Standard Parts Company.

Grinding Machine for Forge Shops

An interesting type of grinding machine has been placed on the market by Forbes & Myers, Worcester, Mass. It is intended for general work in machine and forge shops and snagging smaller castings in a foundry. A somewhat novel arrangement is employed for collecting the dust produced in the operation of the machine, provision having been made for separating the heavier particles from the fine dust.

The general construction of the machine resembles the builder's standard two-wheel machine of the same



Power Elevation for the Spindle Saddles and Traverse for the Uprights and Table as Well as Reversing Feed for the First Two Are Provided in This Duplex Milling Machine Which Is Stated to Have More Power Control than Is Generally Embodied in This Type

size. The heavier particles of metal and abrasive collect in the basin under the wheels, while the finer dust is carried off through a pipe at the rear of each wheel. While provision is made for connecting the machine to an exhaust fan, it is pointed out that the circulation of air caused by the revolution of the wheel is sufficient to carry off most of the fine dust through the exhaust connection. The basin, in which the heavier particles collect, can be readily reached for cleaning by removing the cover over the lower half of the wheels.

This machine is built in one size only for wheels 12 in. in diameter with a 2-in. face. The spindle which extends through the wheels is 1 in. in diameter. Two rests capable of adjustment in two directions, malleable iron wheel guards and ball bearings are included in the equipment. The machine is driven by a fully inclosed 2-hp. motor designed for operation on either two or three

phase alternating-current circuits having frequencies of either 25 or 60 cycles. The speed of the wheels is 1500 r.p.m. on a 25-cycle circuit and 1800 r.p.m. at the higher frequency.

A Special Duplex Milling Machine

A duplex milling machine having more power control than is generally embodied in a machine of this type has been built for the Beloit Iron Works, Beloit, Wis., by the Newton Machine Tool Works, Inc., Philadelphia. The spindle saddles have a vertical adjustment on the uprights, which in turn have a horizontal travel on the base. Reversing feed and fast power traverse are provided for both, the spindle saddles being capable of adjustment either independently or simultaneously. Power traverse is also provided for the table.

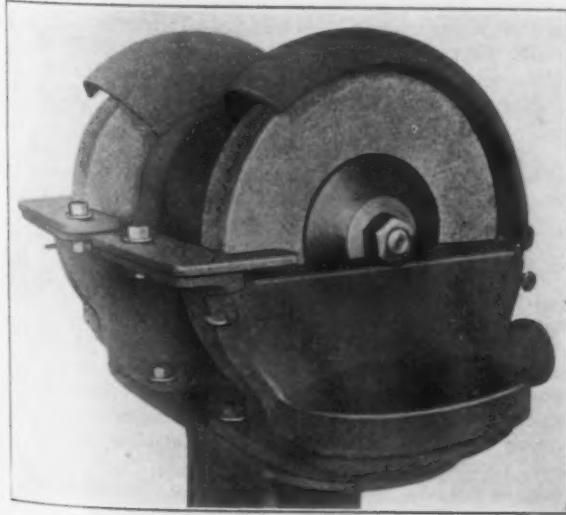
The machine consists of a cross-shaped base, the uprights and the driving motor being mounted on the upright, while the table is located on the cross-piece. The over-all length of the table is 14 ft., while that of the base on which the uprights travel is 4 ft. more. The spindle saddles are mounted one on each upright and are counterweighted. Provision for simultaneous or independent hand vertical adjustment is made and the same arrangement is employed for the reversing vertical feed, which ranges from 0.012 to 0.134 in. per revolution of the spindle, and the reversing fast power traverse, which ranges from 6.1 to 63.4 in. per min. Narrow guide alignment saddles, which have control bearings on the uprights, and provision is made for bolting them rigidly in position at any desired height. The uprights to which the saddles are fitted with taper shoes have independent and simultaneous horizontal hand adjustment and reversing fast power traverse ranging from 5.25 to 54.5 in. per min. If desired, the uprights can also be bolted rigidly in any desired position. The screws for elevating the spindle saddles and adjusting the uprights have bearings at each end.

The spindles are driven through a worm and worm-wheel 27 in. in diameter, both of which are incased for continuous lubrication. Independent clutches are provided for the drive for each spindle at the inside of the driving wormwheel sleeve. The spindles can be rotated independently or in unison at rates ranging from 5.4 to 55.2 r.p.m. The spindle centers are 6 1/4 in. from the face of the uprights, and the distance between the center of the spindles and the table ranges from 2 to 35 in. Adjustments are provided to bring the ends of the spindles to within 12 in. of each other as a minimum or 90 in. as the maximum. The spindles are bored to accommodate a straight plug 3 in. in diameter and are arranged to drive cutters up to 16 in. in diameter by 1 1/4-in. wide-face keys. If desired, a Morse taper, as large as No. 6, can be bored in the spindles, which are drilled through for a cutter retaining bolt.

The work table has square lock bearings on the base with overlapping gibs. Angular rack and worm pinion drive is provided, together with reversing fast power traverse at rates varying from 19.7 in. to 17 ft. per min. An oil-tight gearbox provides for nine sliding gear-feed changes ranging from 0.041 to 0.427 in. per revolution of the spindle without removing the gears. Hand adjustment of the table is also provided.

The machine is driven by a 20-hp. 230-volt motor operating at from 300 to 900 r.p.m., which gives the various rates of feeds and speeds mentioned.

About 25 to 30 per cent of the normal supply of steel available for making British tin plates is all that is really being released, according to a statement in the London Ironmonger.



The Fine Dust Produced in Grinding Is Carried Off through the Pipe at the Back of the Wheel while the Heavier Particles Collect in the Basin Underneath

American Institute of Mining Engineers

Meeting Last Week Prolific in Important Papers and Discussions on the Metallography, Metallurgy and Heat Treatment of Steel

MORE papers bearing directly on the iron and steel industry were presented at the annual meeting of the American Institute of Mining Engineers held last week in New York than at any previous meeting of the Institute. They were in most cases discussed with animation by prominent metallurgists and steel-makers. It is generally recognized that this yearly meeting of the Institute is one of the most important scientific and technical steel gatherings held in the United States and the one this year decidedly strengthened this claim. Of a total of 46 papers, 22 or nearly one-half had to do directly or indirectly with the steel industry. The importance of metallography was made significant by the assignment of two sessions to this subject, one of these two sessions also including the heat treatment of steel.

The Erosion of Guns

The erosion of large guns and the hardening of their surfaces was probably the most interesting subject discussed, brought into prominence, as it has been, by the developments of the war. It involves many important and difficult problems. The discussion was enlivened and enhanced in value by an impressive speech of Hudson Maxim.

The subject was introduced by the presentation in abstract of the paper "Erosion of Guns—The Harden-

ing of the Surface," by Dr. Henry Fay, professor of analytical chemistry, Massachusetts Institute of Technology, Cambridge, Mass. This paper was abstracted in THE IRON AGE, Dec. 7, 1916. Dr. Fay explained in detail the three possible causes for the formation of the hard surface on the inside of large caliber guns and their erosion and stated that it was a problem of research only.

Prof. Albert Sauveur, Harvard University, Cambridge, who presided at this meeting on Wednesday afternoon, Feb. 21, opened the discussion by calling attention to the important public service which Dr. Fay had performed by his illuminating and suggestive paper. He hesitated, however, to accept Dr. Fay's conclusion that the hardness was due to martensite, lacking, as he says it does, a crystalline character. He rather favored the case-hardening explanation, due to the presence of CO and CO₂ with cementation and rapid cooling.

Dr. Fay, in reply, explained that recent work has shown that martensite can be detected in the hardened surface by taking a flat surface for examination rather than a cross section and that this martensite can be definitely developed into troostite.

Hudson Maxim's Testimony

Hudson Maxim, of the Naval Consulting Board, who was present to attend a meeting of some of the Institute's members of that body, in an impressive speech said that when a modern large gun is fired with nitro-cellulose smokeless powder, the heat of combustion reaches from 4000 to 5000 deg. Fahr. If 25 per cent nitroglycerine is present in the powder, the temperature may rise to 5000 to 6500 deg. Fahr. Steel melts at 2650 deg. Fahr. The density of the products of combustion reaches a pressure of 35,000 lb. per sq. in. on

the surface of the metal. A thin film of steel is fused in about one-sixtieth of a second. As soon as the projectile has left the gun, the big outflow of gas washes away a portion of this thin film of used steel. The bore is thus enlarged 1/1000 in. in a 14 or 16-in. gun at each shot. With 58 per cent nitroglycerine, as in some English powder, the erosion is much greater. Mr. Maxim illustrated this by stating that if a steel rod is held very close to a hot electric arc the end is melted but the bar is not warmed beyond the zone of fusion.

When the gases have left the gun, continued Mr. Maxim, the thin film contracts and cracks and deepens the cracks in the metal underneath, similar to a puddle of mud which dries in the hot sun. The tendency to do work on the bore of a gun hardens the entire surface. There is far less erosion in the United States guns than in any other country because the powder is better. The erosion problem has been met by improvements in our smokeless powder which is now the best in the world, though before the war foreign nations did not believe it. Their use of it has demonstrated it to them.

Lawrence Addicks, consulting engineer, New York City, raised the question as to whether there was not an analogy here to the hard surface produced in other metals such as copper wire by cold working, and also whether the question of thermal conductivity did not enter in. To this Mr. Maxim replied that he believed firmly that there was not time enough for any thermal

Gun Erosion—The United States makes the best powder for large guns in the world and there is far less erosion in our guns than in those of any other country.—Hudson Maxim.

conductivity; that one might as well speak of a gun of ice, with superheated steam as the propelling force, so far as conductivity was concerned, except that ice is not so dense as steel.

Dr. Leonard Waldo, consulting engineer, New York City, suggested aluminum bronze for gun linings as highly resistant to the temperature of erosive gases, and illustrated his method of taking some photographs which he had made at Fishers Island of the inside of some large naval guns. He hoped some day to obtain permission to make them public.

Major Wilson, of the U. S. Army, testified that for small arms the proper steel had been found to be a plain carbon, basic but preferably acid, open-hearth steel, containing 0.45 to 0.55 per cent carbon and 0.90 to 1.30 per cent manganese with the other elements normal.

Treatment of High Speed Steel

"Notes on the Heat Treatment of High Speed Steel Tools," by A. E. Bellis, metallurgist, New England Westinghouse Company, Boston, Mass., and T. W. Hardy, metallurgist, Nova Scotia Steel & Coal Company, New Glasgow, N. S., was presented in abstract by Mr. Bellis. This paper was reviewed in THE IRON AGE, Feb. 15, 1917.

Prof. Sauveur introduced the discussion by the statement that it is not best to heat all high speed steel to the same temperature; that a properly treated piece should show an austenitic structure. The industry lacks a quick and reliable method to determine when the proper temperature is attained.

Dr. John A. Mathews, president Halcomb Steel Company, Syracuse, N. Y., congratulated the authors on the practical bearing and importance of the paper and exhibited some slides of a steel similar in com-

position to one of those in the paper showing the structure at different temperatures.

Collin G. Finck, New York City, suggested that the decarbonizing effect of a bath of barium chloride could be overcome by having tungsten in solution in the bath.

"The Effect of Time in Reheating Hardened Steel Below the Critical Range," by C. R. Hayward, assistant professor of mining engineering and metallurgy, Massachusetts Institute of Technology, and S. S. Raymond was presented by Professor Hayward. It is abstracted in this issue of THE IRON AGE. It brought out some adverse comment. Professor Sauveur was reluctant to accept such conclusions and Doctor Mathews referred to other work on this subject, including his own paper four years ago before the American Society of Mechanical Engineers on alloy steels, and reviewed in THE IRON AGE, Dec. 10, 1914. He believed the results of Professor Hayward attributable to the use of mild steels.

Sulphur in Steel

Sulphur in steel was brought before the Institute by a paper, "The Effect of Sulphur on Low-Carbon Steel," by Prof. C. R. Hayward, assistant professor of mining engineering and metallurgy, Massachusetts Institute of Technology, Boston, Mass. Part of this paper was published in THE IRON AGE, Oct. 5, 1916. Professor Hayward presented the paper in abstract.

Professor Sauveur, in opening the discussion, suggested that, in the opinion of some, the time might not be far distant when a premium would be paid for the presence of sulphur in steel. Dr. John S. Unger, manager, central research bureau, Carnegie Steel Company, Pittsburgh, Pa., whose paper on this subject before the Society of Automobile Engineers in 1915, and printed in THE IRON AGE, Jan. 13, 1916, created much interest, offered the following important new testimony:

Prof. Hayward's results are in accord with my own.

made chains, sheets, wire, nails, tubes, pipe, drop forgings, channels, plates, axles, rails and wire cable. Owing to the variety of products investigated, it was sometimes necessary to use steel a little softer or harder than that ordinarily used for the same purpose. This, however, had no influence on the comparative results.

In the fabrication of these products, the usual works practice was followed in the production of the finished article, no preference being given in the treatment of steel of one sulphur content over that of another. The material was subjected to the tests regularly prescribed for steel products of the varieties mentioned, and in addition, special tests were made on most of the products.

It was not my object to study the state in which the sulphur existed in steel or its microstructure. What I wanted to learn was what effect different amounts of sulphur had on the working of the steel and its effects on the properties of the finished article. This is what concerns the user of the steel.

A paper read before the Society of Automobile Engineers and given in their proceedings for 1916, and in THE IRON AGE, Jan. 13, 1916, gives the results of a great many of these tests, particularly those of interest to the automobile industry. Another paper, presented before the American Boiler Manufacturers' Association and given in their proceedings for 1916, describes an extensive series of tests on the influence of sulphur in rivet steel.

I will not review these results here, but will briefly refer to some of the tests which were not covered in these papers such as, tubes, plates, rails and wire products.

Sulphur in Tubes, Plates and Rails

Referring first to the tests on tubes, a series of 50 2-in. boiler tubes were made of each sulphur content, and all met the regulation hydraulic pressure test without failure. The welding practice on the tubes of 0.050 and 0.090 per cent sulphur was better than the practice on the tubes containing 0.030 per cent sulphur. A series of 4-in. seamless tubes was also made and subjected to different tests. The tubes of 0.068 per cent sulphur as a whole gave better results than the 0.032 per cent sulphur tubes. In the higher sulphur steels there was a slight falling off in tensile

Sulphur in Steel—Too much stress has been put on the harmful influence of certain elements in steel. Often a high sulphur steel rolls or works better than a low sulphur one.—Dr. J. C. Unger.

They further tend to prove the fact that the old established prejudice against sulphur is based more on belief than actual facts.

I have felt for years that too much stress was placed on the harmful influence of certain elements in steel; such as, sulphur, phosphorus, copper, etc. Practically all the investigations made to date have proven that these elements within reasonable limits are harmless and, in fact, for certain purposes the addition of these elements is beneficial.

In referring to copper, Dr. J. E. Stead, vice-president of the British Iron and Steel Institute, at the last meeting stated: "Even to-day one comes across steel specifications in which copper is barred, which can only be regarded as an indication of the ignorance, if not stupidity, of those who prescribe the composition of steel, for it has been long ago proved that copper in steel, instead of being an evil, is quite harmless, and is sometimes distinctly beneficial."

Sulphur owes its evil name to the early days of the manufacture of steel. It being a comparatively easy element to determine chemically with reasonable accuracy, particular attention was called to the amount of sulphur, and failures were attributed to it, without giving any consideration to other causes. A prejudice against sulphur was thus formed, which still exists. As a result, the permissible sulphur content in steel is so low in some cases, that it is questionable if the excessive purification necessary to produce such results is not detrimental to the steel.

It has been my experience that occasionally a high sulphur steel would roll or work much better than a lower sulphur steel, yet the steels would be apparently the same in composition, excepting the sulphur. At other times the reverse would be true. If a certain amount of sulphur produces a particular effect, to be consistent it should always produce the same effect.

My investigation of the influence of sulphur in steel covered tests of considerable quantities of several kinds of steel in various sizes ranging from small roofing nails to 8-in. channels and railroad axles, with sulphur contents of from 0.025 to 0.254 per cent.

The products tested were rivets, machine and hand-

strength, but an increase in ductility as shown by the elongation.

The investigation of plates consisted of an extensive series of longitudinal and transverse tensile, torsion and bend tests, welding and hot and cold flanging tests. The results of these were practically the same for plates of all sulphur contents.

Steel of 0.51 per cent carbon with varying sulphur contents was rolled into 100-lb. rails. Tensile and drop tests were made. There was a slight decrease in the tensile strength in the high sulphur rails, but an increase in ductility as shown by the elongation in both the tensile and drop tests. Rails of each sulphur content were then put into actual service in a railroad track, and although lower in carbon than steel ordinarily used for rails, which reduced the life of the rails, all of them, regardless of the sulphur content, showed about the same amount of wear.

In the investigation of wire products, one of the studies made was the influence of sulphur in the manufacture of roofing nails with a very large, thin head. The upsetting of the head is a particularly severe operation, yet the steel of the highest sulphur content made as perfect a head as the lower sulphur steels.

Another study was the electrical welding of wire. When welding the wires for continuous drawing or in the manufacture of fencing, where the wires are welded at right angles to each other, it was found that steels of all sulphur contents could be perfectly welded.

In making the regulation twist and bend test of galvanized wire, the wires all met the requirements of this test, and the coating adhered perfectly, regardless of sulphur content.

The tests of wire cable showed that cables containing up to 0.10 per cent sulphur gave practically the same results in the tensile, twist and life tests.

Attention has been called by other investigators to the fibrous condition of high sulphur steels. This fact was particularly noticeable in our study of case-hardening. After the steels had been case-hardened and quenched, all showed the same depth of case and hardness. When fractured, the low sulphur steels would snap off square and show a crys-

talline fracture, while the higher sulphur steels, instead of snapping off square, had to be bent backward and forward before they would break, and the fracture would be irregular and have a fibrous appearance.

The results of this investigation confirmed my belief that steel could contain a great deal more sulphur than that usually permitted and still be of good quality. The work of Wahlberg, Arnold, Stead, Cooper, Hayward and other investigators has done much to strengthen this belief. There is still a large field for investigation and a much larger work in distributing the knowledge thus gained to all those interested. This seems to be the only way by which any erroneous beliefs can be replaced by actual facts, which later find a practical application.

Dr. Leonard Waldo stated that Mexican oil, high in sulphur, would be the fuel of the future for the steel industry. Although as much as 0.01 per cent of sulphur is added to steel from such fuel alone, he believed such additions had little effect on the product. Dr. Unger, in reply to some questions, insisted that the use to which the steel was to be put, and not the sulphur content *per se*, was the important question and that all investigations had been made by him and should be made by others under commercial conditions.

The lateness of the hour precluded a merited discussion of the paper, "A Method of Distinguishing Sulphides from Oxides in the Metallography of Steel,"

only, as oxidation or deoxidation is largely a question of temperature. Any investigation of the effects of what are usually called deoxidizers is likely to lead to confusion. It is impossible to say when a deoxidizing agent ceases to act as a deoxidizer and begins to confer certain physical properties to a steel.

Manganese may be beneficial in conferring hot or cold working properties, and the quantity is usually specified, but steels are made in large quantities every day which do not contain manganese. Again manganese affects the qualities when added above the usual amount, as manganese steel.

Silicon, another well known deoxidizer, is found in nearly all steels. When added in fairly large proportions, as in silicon tool steel, silico-manganese steel, or in certain steels of special magnetic properties, it completely changes the character of the steel as the manganese did in the preceding example. Such examples can be multiplied.

Very few steels are made by the addition of manganese alone. The three common deoxidizers, manganese, silicon and aluminum, are nearly always used in ordinary steel-making. Sometimes but two are used, very rarely one alone. It would appear that each is necessary, and has its function when applied at the proper time and place.

Expérience has shown that manganese and silicon are best added to the bath or ladle, and aluminum to the mold. It is of interest to know that in some experiments made by using an alloy of these three metals and iron, the effect was

Manganese Supplies—Explorations by the U. S. Geological Survey indicate the possibility of large deposits of high-grade manganese ore in Central America and northern South America and adjacent islands.—D. F. Hewitt.

by George F. Comstock, metallographist, Titanium Alloy Mfg. Company, Niagara Falls, N. Y. Professor Sauveur styled it a distinct advance in metallography and a valuable method of differentiating oxides from sulphides.

Steel Deoxidizers and Manganese Supplies

Manganese supplies and the seasoning of cast-iron castings were the two prominent subjects discussed at the morning session on Wednesday, Feb. 21, at which Henry D. Hibbard, consulting engineer, Plainfield, N. J., presided. The former topic was introduced by a paper by F. H. Willcox, metallurgical engineer, U. S. Bureau of Mines, Pittsburgh, Pa., "Significance of Manganese in American Steel Metallurgy," which was read by title in the absence of the author. Aside from the discussion of various oxidizers in steel manufacture, the data on our supplies of manganese ore and ferromanganese are based largely on articles published in THE IRON AGE from time to time, one of the tables being compiled from such an article and the calculation of our available supply being almost identical with a similar one in THE IRON AGE, Oct. 12, 1916.

An Important Forecast

D. F. Hewett, of the U. S. Geological Survey, Washington, D. C., in discussing this paper, spoke briefly of the geological formation and genesis of some of the large manganese deposits of the world and concluded with the startling announcement that he believed that the geological conditions in Central America and northern South America had been such that exports now in process would recover large and important quantities of high grade manganese ore, aside from those in Brazil. He cited some recent discoveries in Costa Rica where mining and shipments are assuming larger proportions. One instance of this has been referred to in THE IRON AGE, Feb. 22, 1917. Surveys already, he said, indicate ores in Porto Rico, Panama, Mexico and northern South America. He emphasized our woeful deficiency in such supplies and our dependence on foreign sources.

Dr. J. S. Unger, Pittsburgh, read a written discussion of this paper, part of which was as follows:

When we speak of a metal, alloy or compound as a deoxidizer in steel manufacture, the term is a relative one

to make a better product than when the constituents were added alone at different stages of the heat.

Substitutes for Manganese, Silicon and Aluminum

Many elements have been tried as substitutes for the three mentioned. Magnesium has been proposed as a substitute for aluminum, as it has a stronger affinity for oxygen. A simple calculation will show that one pound of magnesium will take up 0.66 lb. of oxygen, while one pound of aluminum will take up 0.89 lb. of oxygen.

When the magnesium in sticks $\frac{1}{4}$ in. square was added to the mold, it resulted in an explosion, blowing part of the steel out of the mold, making it a dangerous operation. These disadvantages, together with an extra cost of 100 per cent over aluminum (before the war prices), condemned its use.

Calcium, sodium, titanium, vanadium and boron alloys have been tried in various combinations. My experience with those I have tried is the following:

1. Their cost is too high to permit of ordinary commercial use.

2. When used alone, the steel is not of good quality.

3. To show favorable results they must be assisted by one or more of the common deoxidizers.

Slight honey-combing or sponginess, which must not be confused with piping, is rarely injurious, as these small cavities, if unoxidized, unite into a common mass if the steel is rolled or forged. Their presence cannot be detected by physical tests nor does the finished material give poorer service when put into actual use. A very minute quantity of gas may produce a cavity $\frac{1}{4}$ in. in diameter. An ingot containing about 0.001 per cent of oxygen, existing as carbon monoxide, will at the freezing temperature of the steel occupy a volume equal to the volume of the ingot.

While I do not agree in using the mechanical tests as a measure of the quality of the deoxidizer, owing to the effect such material has on the steel itself, the results show very little difference. To my mind, a good deoxidizer must have these qualities:

1. For the work it will do, it must be cheaper than any other deoxidizer.

2. It must alloy with iron in any proportion.

3. Adding a small excess should not influence the quality of the steel, or perhaps I can make it clearer by saying an overdose should do no particular harm.

4. It must confer better hot working qualities.

5. The resulting product of the reaction must be easily fusible and of much less weight than the steel, in order that a prompt separation may take place.

Piping, segregation, soundness, specific gravity, etc., are secondary qualities, and can be almost entirely removed by cropping. No single one of the common deoxidizers possesses

all the qualities specified above, but a careful use of them at the proper time is not alone cheaper, but has given better results than any materials tried thus far.

Prof. Joseph W. Richards, Lehigh University, South Bethlehem, Pa., characterized the author's discussion of deoxidizers in steel as too brief and hence faulty. The statement that the heat of reaction from the use of aluminum was appreciable and sufficient to cause increased fluidity he said was not so; it is not enough to raise the temperature one degree C. Its chief function is to remove ferrous oxide, FeO, which tends to impair the fluidity. Aluminum does not prevent blow holes due to the non-solubility of gases, but the prevention is due to the removal of ferrous oxide. This country would be in a deplorable condition if cut off by sea warfare from foreign manganese ores, but Professor Richards believed much could be done with high manganese slags and the double or special treatment of these and manganiferous iron ores of both of which there are large quantities.

Magnesium as a Deoxidizer

Dr. Leonard Waldo brought up the subject of magnesium as an important possible deoxidizer especially if used as an alloy with iron. He believed a market for this would result from such a use similar to the creation of a market for aluminum in steel metallurgy in its early days. He stated that a large company in Maine was now producing magnesium with 40 electric furnaces commercially and offered the following as a recent analysis of this product:

	Per Cent
Magnesium	99.867
Silicon	0.032
Iron	0.037
Copper	0.028
Zinc	0.036
Aluminum	Trace
Cobalt, bismuth, lead, nickel, cadmium	None
Specific gravity	1.74

Edwin F. Cone, of THE IRON AGE, in a written discussion which was not offered but which will appear in the Institute's proceedings, challenges the author's statement that titanium, "when used alone, is not as effective a deoxidizer as when used with ferromanganese, to replace appreciable quantities of the latter." Authority for this assertion is asked of the author as well as whether an authoritative scientific statement has been made public which demonstrates that titanium is a substitute for ferromanganese.

Mr. Cone also calls attention to the fact that Table 1 on page 204 of the paper is based on an article in THE IRON AGE of Oct. 12, 1916, the data for production being from the blast-furnace reports of THE IRON AGE. Later data from the same source, published in THE IRON AGE, Feb. 8, 1917, show the production of ferromanganese in the United States in 1916 to have been 208,389 gross tons; that of spiegeleisen 197,518 tons, or a total of 405,807 tons—a record output of both alloys. With imports of 77,836 tons, the apparent available supply is 286,225 tons against a possible consumption of 297,864 tons based on a steel output in 1916 of 44,000,000 tons with 17 lb. of ferromanganese necessary per ton of steel produced against 19 lb. assumed by Mr. Willcox, who figures a deficit of nearly 100,000 lb. of ferromanganese. This is pointed out as being contrary to facts and probabilities.

Substitutes for Ferromanganese

Henry D. Hibbard, in discussing the question of substitutes for ferromanganese, had the following to say:

The fundamental reason why manganese is not wholly replaceable in making steel of the class under consideration seems to lie in the fact that its oxide forms with silica and iron oxide very fusible silicates which wet each other when they touch and so collect together, and when large enough float to the surface.

Other elements such as silicon, aluminum, calcium and magnesium have stronger affinity for oxygen than manganese has, but their oxides are insoluble and infusible in the molten steel, and when these elements are used for deoxidizing without manganese the steel is liable to be red-short, due to the widespread diffusion of the solims which cannot, or do not, escape.

As for aluminum, the proportion the author calls very small, about 0.05 per cent, would better be called very large, amounting as it does to about 18 oz. per ton. Three ounces

to the ton is common in moderately well-made open-hearth steel, and 6 oz. with about 0.20 per cent of silicon will kill any ordinary ingot steel. If it does not, the furnace practice is not good. A half an ounce per ton will often determine whether or not a well-made steel will "rise" or "stand" in the ingot molds.

German Manganese Slags

The present scarcity of manganese and manganese ore in Germany has, as the author states, been met by the utilization of blast furnace slag accumulations of the past. These slags are smelted in electric furnaces, the alloy produced at one plant analyzing about 60 per cent manganese, 20 per cent silicon and 2 per cent carbon. The phosphorus is, of course, very low, as all that in the ore originally went into the metal on the first smelting.

Economy of manganese is now demanded. In the first place, let it be realized that freedom from redshortness is due not to the presence of manganese, but to the absence of impurities, both soluble and insoluble, which cause it. Steel made from wrought iron and charcoal or blister bar, would seldom, if ever, have any manganese, yet such steel was regularly made for half a century before Heath used manganese ore in the crucible. Acid open-hearth steel may have much lower manganese than is ever specified and be free from redshortness.

In the first practice I personally knew of following Martin's first plan, a bath of pig and scrap was melted and then diluted with charcoal direct-process blooms made in the Catalan forge, and in three years, during which I knew about it, no steel showed any redshort tendency. We heard of redshort steel elsewhere, but otherwise knew nothing about it. Our soft steel for boiler plate contained from 0.2 to 0.3 per cent. of manganese. The slags were extremely vitreous, apparently without any uncombined iron oxide and the continued cleansing effect with such a slag, due to time, with some manganese in the bath, and the stirring caused by working the blooms (which were preheated) in the bath practically eliminated the oxides of every sort which, if present, would have tended to make the steel redshort.

The content of manganese is still incorporated in some specifications for structural steels, but it is doubtful if those who do it can give any proper reason therefor. They apparently do it because their predecessors did. Much good steel has been rejected because the manganese was too low when a little more haste in casting would have kept it within the specification by retaining a part of the manganese which was, as it ought to have been, consumed in reducing iron oxide making the steel so much the better.

When steel to be tempered requires low manganese, no objection is found in so specifying, but superior or varied furnace practice by which steels may be made free from redshortness and low in manganese is barred or manganese is wasted.

The Seasoning and Growth of Cast Iron

The interesting subject of the advisability of allowing cast iron castings to season before using, as well as the growth of cast iron, was brought before the meeting by Dr. Richard Moldenke, consulting metallurgist, Watchung, N. J., who presented an abstract of his paper "The Seasoning of Castings" which was published in THE IRON AGE, Feb. 1, 1917. Dr. Moldenke stated that seasoning could be hastened by annealing and that a large automobile manufacturer takes one cut off many of its castings and then anneals them, the practicability of storing for seasoning being out of the question with that company. He also made the statement that there is not a single iron casting made that is really sound in the strict acceptation of that word.

The discussion of this subject was enlivened by the presence of Alexander E. Outerbridge, Jr., of Philadelphia, who contributed to the discussion the statement that it has long been known that iron castings improve with age. He cited the case where it had been difficult to break a number of old cast-iron cannon. It was discovered that there was a decided difference between the old ones and the new ones which broke easily. Chemical composition was not the cause and attempts to duplicate the strong iron in the old cannon were failures. Their seasoning for a long period was the only explanation.

Mr. Outerbridge also cited experiments where tumbling in a tumbler iron castings and bars had increased their strength 40 per cent due to the shock. This method of cleaning was preferable, for that reason, to pickling. In this connection he also exhibited two cast iron bars of the same metal, one of which had been made to grow. These bars had been exhibited by

him 13 years ago at the Institute's meeting in Atlantic City in 1904. Both bars were originally 14 13/16 in. long and 1 in. square or a total cubical content of 14.8125 cu. in. By treatment one had been increased or made to grow until it was 16.5 in. x 1 1/8 in. x 1 1/8 in. or 20.882 cu. in., an increase of 40.98 per cent, with the weight unchanged. This had been accomplished by heating the bar in a steel pipe repeatedly to about 1550 deg. Fahr. The metallurgical appearance was unchanged.

Stresses in Steel

Remarks by Henry D. Hibbard on Dr. Moldenke's paper were to the following effect:

This suggestive paper brings up an important though obscure subject regarding which more knowledge is needed. In addition to the internal stresses due to cooling from the casting temperature in the cases cited by the author, there are others which occur in certain kinds of steel articles, which may properly be considered with them in connection with seasoning. Thus a piece of cold drawn shafting if turned in a lathe will not be straight because the resultant of the internal stresses remaining is not the same as that of the stresses in the original piece. Again a hardened steel shot contains internal stresses which may cause it to spontaneously crack, the most common case being that its point breaks off. This usually happens within a few weeks after hardening, if at all.

In the castings and shot the internal stresses are due to different rates of cooling of the various parts as the surface always cools in advance of the interior, and must do so unless the rate of cooling is infinitely slow. In the cold drawn shaft the internal stresses are set up by the cold work done in drawing the bar through the die.

How do these stresses compare, and are they to be lessened or eliminated by the same seasoning? If so, what seasoning is best? Will a permissible time alone do it at uniform atmospheric temperature? Probably not. Will time alone do it at some moderately elevated temperature, say not over 200 deg. C.? Possibly. Should the article be repeatedly heated moderately and then cooled? Probably. The daily fluctuations in temperature may be enough to effect seasoning in time. Old articles do not break spontaneously, nor presumably have excessive internal stresses.

Iron castings have been seasoned by being kept for some days or weeks in a core baking oven with the temperature fluctuating from atmospheric up to 110 or even to 150 deg. C.

Some projectile specifications require that the hardened shot be heated to the temperature of boiling water. Those which pass this ordeal without cracking are not liable to spontaneously break thereafter. The reason may be either that the heating increases the internal stresses so that if a projectile is in a dangerous condition it will break then as a consequence, or that the heating, if accomplished without rupture, by its annealing effect lets down the internal stresses so that the danger of spontaneous rupture is avoided.

Howard found in retesting iron test pieces which had been pulled beyond the elastic limit a quarter of a century before that the elastic limit remained at the point at which the previous test was discontinued, showing no seasoning effect due to that length of time and ordinary temperatures.

On the other hand, as far as I have been able to find out, no pieces of good tempered steel are known which are more than a few centuries old, and one surmises that seasoning has taken place in the old weapons. A friend of mine who tried with a file the hardness of some old pieces of steel in the British Museum came near being arrested therefor. The whole subject needs investigation, the work being started now and being finished perhaps by future generations.

Roll Scale in the Bessemer Process

"Roll scale as a Factor in the Bessemer Process," by A. Patton, superintendent steel works Jones & Laughlin Steel Company, Pittsburgh, and F. N. Speller, metallurgical engineer, National Tube Company, Pittsburgh, was presented in abstract by Mr. Speller. The following paragraphs give the main features of the paper:

Experience has shown that the judicious use of roll scale in the Bessemer operation will not only increase production and reduce cost, but that at the same time it will improve the general quality of the steel. Most of the data on which these conclusions are based were obtained at the Bessemer plant of the National Works, National Tube Company, McKeesport, Pa., with the assistance of George Hitchins, superintendent of steel works, and others of this company.

The proper use of roll scale, pig and steel scrap enables the blower to turn down his heats nearer to the same point

in carbon by giving a sharper contrast on the final changes in the flame. This makes the loss in manganese and the residual manganese in the steel more constant. It also enables all heats to be blown more nearly in the same time and to the same temperature, which, of course, is favorable to uniformity in heating and rolling and makes all dependent operations more systematic.

We have attempted to give briefly the results of 16 years' experience in the use of roll scale under the conditions that prevail at this particular plant. However, in summing up the benefits derived, as better steel, increased production and lower cost, we would not have the reader conclude that this is a "cure-all," as the practical Bessemer operator will readily appreciate that there are many other details such as temperature, ladle reactions, etc., which will require just as much attention as ever. Aside from all other factors, however, the judicious use of roll scale is a study within itself.

Mr. Carey, Youngstown Sheet & Tube Company, Youngstown, Ohio, in discussing the paper testified that his experience was that the tonnage was increased 20 per cent when roll scale was used in Bessemer practice. C. S. Robinson, second vice-president of the same company, corroborated the main points in the paper.

Henry D. Hibbard read a short written discussion which was in part as follows:

This paper deals with an advance in Bessemer steel practice, which was assumed by most steel metallurgists to have reached its highest attainable development. The three features—1. Using iron oxide instead of a part of the far more expensive crude iron of the charge. 2. The greater cooling effect of that oxide as compared with scrap, thus lessening the amount of scrap needed or permitting higher silicon in the crude iron. 3. Shortening the time of blowing so as to get a greater output—are each of them important and worthy to be considered a distinct step forward in the art.

The first feature owes its value in part in supplying oxide of iron for the requirements of the slag instead of causing metallic iron to be oxidized for that purpose.

The second feature, greater cooling effect, comes from the absence of heat ordinarily generated by the oxidation of some of the iron of the charge and also to the absorption of heat in the reduction of metallic iron from its oxide. This latter takes place to a small extent through the reducing power of the silicon while that element is still plentiful in the charge.

The shortening of the blow comes from the presence of the vessel at the start of available oxygen in the roll scale which lessens the quantity of air required to be blown in to complete the oxidizing processes.

The benefit from the lessened cost per ton of ingots is, in times of great demand, like the present, overshadowed by the profit on the increased production. For a dime saved in costs a dollar is made in profits.

Temperatures in Steel Making

The remainder of this session was taken up with Dr. George K. Burgess' paper on "Temperature Measurements in Bessemer and Open-Hearth Practice" and that on "The Manufacture of Weldless Steel Tires for Locomotive and Car Wheels," by Guilliaem Aertsen, assistant to vice-president, Midvale Steel Company, Philadelphia. Both papers were presented by the authors and were reviewed in THE IRON AGE, Feb. 15, 1917.

In discussing the former paper Professor Richards testified to his affection for a radiation pyrometer and expressed the wish that Dr. Burgess had used the two pyrometers together and distinguished between an optical emissivity and a thermal emissivity. Dr. Burgess explained the impracticability of using a radiation pyrometer in many cases because of the heat and said his opinion had not been changed as to the relative efficiency by recent use of a radiation pyrometer.

At the close of the meeting the Leeds & Northrup Company, Philadelphia, exhibited the instrument with which the temperatures in the investigation of Dr. Burgess had been taken.

The Blast Furnace and Potash

The blast furnace as a source of potash was the chief topic discussed at the session on iron blast-furnace practice, Tuesday afternoon, Feb. 20, presided over by Prof. J. W. Richards. R. J. Wysor, superintendent of blast furnaces, Bethlehem Steel Company, South Bethlehem, Pa., in presenting his paper exhibited various samples of the by-products referred to in the paper,

an abstract of which was published in THE IRON AGE, Jan. 18, 1917.

Dr. J. S. Unger, manager Central Research Bureau, Carnegie Steel Company, Pittsburgh, Pa., read an important discussion of this paper, part of which was as follows:

Mr. Wysor has presented a paper on a comparatively new subject which is not alone very interesting but of great importance to the whole country as well as the iron and steel industry, as it furnishes a new source for potash. It is a question to which we have given considerable attention, our investigations covering various waste products from six of our plants with a view to recovering the potash or using the waste product itself as a fertilizer.

Our studies have covered the determination of the potash in blast-furnace slag, water from slag granulating pits, blast-furnace flue dust, deposits in blast-furnace boiler combustion chambers, in flues leading from boilers to stack and deposits in the stack, deposits in the hot-blast stove combustion chambers and the dust accumulations in the last passes of stoves or flues near stack, open-hearth furnace slag and the deposits in the regenerator chambers of open-hearth furnaces.

Our blast furnaces operate principally on a burden of Lake Superior ores, Ohio and Pennsylvania limestone and Connellsville coke, and the amount of potash in our various waste products would naturally differ somewhat from that found at Eastern blast furnaces, run on an entirely different burden.

We found that our blast-furnace flue dust carried only a few tenths of a per cent of potash; the blast-furnace slag, about 0.50 per cent; water from slag granulating pits, traces; deposits in blast-furnace boiler combustion chambers, about 0.50 per cent; and deposits from the last passes of hot-blast stoves, from 1 to 1.50 per cent. In a general way the potash we found in the various materials was either insoluble, or in the most favorable cases, about one-third water soluble.

The Carnegie Steel Company's Investigation

Considering our results as a whole and the amount of the various products produced, a sufficiently high percentage of potash was not found to make it desirable to attempt to recover the potash from such materials.

Sometimes the potash is fixed, passing through the furnace, and is found in the slag, at other times it appears to be easily volatilized and is found in the largest quantities in such portions of the furnace which are comparatively cool, such as the gas flues, regenerator chambers or stack. Occasionally we have found in locations quite distant from the furnace a few ounces of a grayish or reddish fume very high in potash, but the quantity is too small to be considered. As an example, we found 58 per cent of potash in a fume adhering to a blast-furnace stove chimney valve, 21 per cent on the brick near the stack in a blast-furnace boiler, 20 per cent in a fume in a boiler stack, 43 per cent in a deposit on the piston of a gas engine, and 7 per cent on the vanes of a Theisen gas washer. These figures indicate that the potash is carried for quite a distance to a cool spot before the most of it is deposited.

From Mr. Wysor's work it appears that there would probably be a larger yield of potash from furnaces working on certain alloys, and we are at present making determinations of the amount of potash in various deposits around furnaces working on ferrosilicon and ferromanganese.

Potash from Manganese Furnaces . . .

L. E. Riddle, superintendent of the Isabella and Lucy furnaces making ferromanganese and spiegeleisen for the Carnegie Steel Company, in response to questions whether the potash yield was not greater in such furnaces because Mr. Wysor's paper showed high grade manganese ores to contain more potash than iron ores, stated that not over 2.3 per cent water soluble potash had been found in flue dust from such furnaces with less in dust from other places. Mr. Wysor was, however, of the opinion that much of the potash had been removed in the wash water and that more really existed than in pig-iron furnace practice.

Lynn Bradley, chief engineer Research Corporation, New York City, in collaboration with H. G. Egbert and W. W. Strong, both of the same corporation, presented abstracts of his two papers, "Dry-Hot Versus Cold-Wet Blast-Furnace Gas" and "Some Suggestions Regarding Construction of Hot Blast Stoves." The former paper was printed in abstract in THE IRON AGE, Feb. 22, 1917. The other paper was noticed in our issue of Feb. 15, 1917.

R. J. Wysor discussed these papers in part as follows:

The authors have made an interesting theoretical comparison of the relative merits of the dry and wet methods as applied to the cleaning of blast-furnace gas. Their suggestions, in general, are in line with actual practice and endeavor in the construction of modern blast-furnace stoves.* Preheating the combustion air, as suggested by the authors, is in advance of present practice; for three-pass stoves this would be a more difficult proposition than for two or four-pass units.

Cleaning by Electrical Precipitation

In my paper on potash I have stated that at Bethlehem almost perfect cleaning of the raw gas leaving the dust catcher was accomplished in a small experimental Cottrell treater. It is reasonable to suppose that time and experience will be required to develop the electrical precipitation method on a full size scale for blast-furnace conditions. However, there seem to be no insurmountable difficulties in the way of such development. Certainly much time and money have been expended in developing wet washing processes, and there is still room for improvement.

In the event of the ultimate installation of large electric precipitators in connection with new blast furnaces, in plants where gas fuel is at a premium, the logical plan would be to insulate all mains, etc., leading from the furnace to boilers and stoves and from the latter back to the furnace; this would include downcomers, dust catcher, precipitators, connecting mains, boilers, stoves and hot blast system.

From a practical operating standpoint, however, the difference in B.t.u. saving or maintenance of a slightly higher flame temperature as effected by one system of gas cleaning over the other is of less importance than the relative cleanliness of gas produced. Especially is this true in hot-blast stove practice. The glazing or destruction of brick work, or the blocking of checker openings, due to unwashed or imperfectly washed gas, is responsible for a far greater loss in stove efficiency than is a slight difference in thermal value of the fuel gas. The maintenance of brick work in stoves for regenerative purposes is destined to receive much more attention in the future than in the past. Furthermore in some blast-furnace plants, chiefly isolated merchant furnaces, there is an excess of fuel gas available, and hence the thermal value within ordinary ranges is of little moment.

Whether the wet or dry system of blast-furnace gas cleaning for the average plant finally predominates, of course, depends upon various factors, such as first cost, operating cost, space required for units, dependability and safety of operation and cleanliness of gas produced. Other conditions being about equal, the superior system will be the one which cleans gas to an appreciably lower average dust content than the other. If there is no appreciable difference, other conditions being about equal, the balance of favor will be with the dry process.

The viscosity of blast furnace slags was brought before the Institute by a paper by A. L. Feild, assistant metallurgist, U. S. Bureau of Mines, Pittsburgh, on "The Viscosity of Blast Furnace Slags." Early notice of the subject appeared in THE IRON AGE, Nov. 25, 1916, when the first information was made public by Mr. Feild.

The World's Largest Electric Furnace

At the close of this session a communication was read from William R. Walker, U. S. Steel Corporation, New York City, expressing his regret at not being able to be present and stating that the new Heroult electric furnace which has been operating at Duquesne, Pa., since early in November easily produces 30 tons of steel and is operating successfully. Photographs of this furnace were exhibited as the largest electric steel furnace operating in the world.

The other sessions of the meeting on metallography and milling and smelting on Monday, Feb. 19, were reported in THE IRON AGE, Feb. 22, 1917.

Social Features

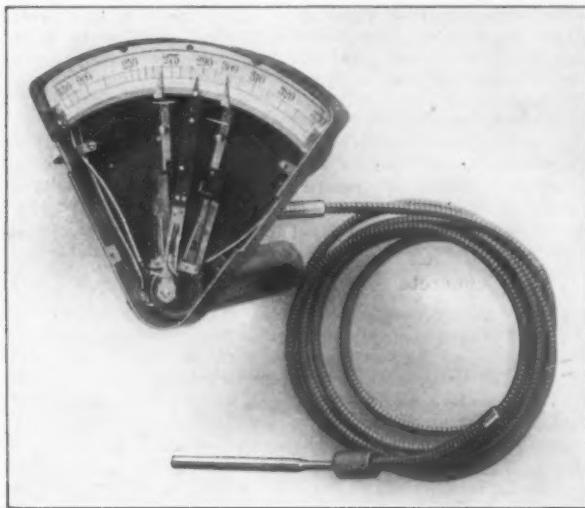
The social features were numerous and interesting. Besides the smoker and reunion on Monday evening and the annual dinner on Tuesday evening, Herbert T. Kalmus, a member of the Institute, gave on Wednesday evening the first public exhibition of moving pictures in natural colors as brought out by the Motion Picture Technicolor Corporation of Boston, an invention of his own and others. An excursion by special train to the West Point Military Academy took up the entire day Thursday, Feb. 22. Capt. Stuart C. Godfred, Corps of Engineers, U. S. A., addressed the 400

*Progress in Hot-Blast Stove Design. Arthur J. Boynton (American Iron & Steel Institute, 1915).

excursionists emphasizing the fact that in time of war the army must look to engineers to solve many vital problems, since modern war is largely an engineering proposition. The issue each day of the anonymously edited daily convention paper, *The Fume*, enlivened the proceedings in general. The luncheons served daily between the technical sessions were valuable as an opportunity for further acquaintance and the exchange of ideas.

Automatic Furnace Temperature Control

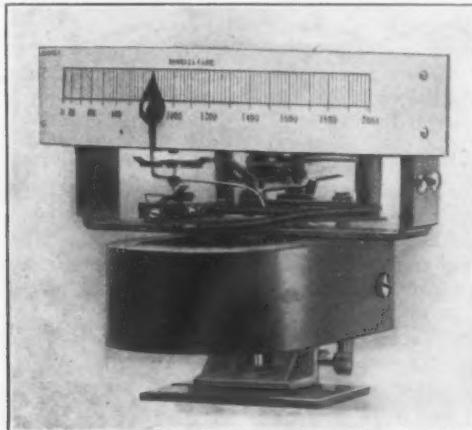
For regulating the temperature of furnaces employing oil or gas fuel or heated by electricity, the Bristol Company, Waterbury, Conn., has developed a new line of automatic devices. Three elements are employed,



The Air and Fuel Supply Valves of Gas and Oil Fired Furnaces or the Circuits of Electric Furnaces and Ovens Are Opened or Closed by a Thermostat-Thermometer Device

the measuring, the contacting and the operating, the controlling element being combined with the first.

The measuring element is one of the maker's types of electric pyrometers and thermometers, the one usually employed being a thermoelectric pyrometer with a millivoltmeter movement and patented separable couples, although a vapor-filled type of thermometer, which is extensively used for recording temperatures, is also employed. The controlling element, which consists of a patented electrical contact closing device operating at predetermined high and low temperatures, is combined with the measuring element. The function of this element is to open or close electric circuits, thus disconnecting or energizing the operating element. The operating element consists of the device actually regulating the heat supply to the furnace. This is a pair of electrically operated gas and air valves for a gas-fired furnace and a special relay switch opening and closing



The Indicating Arm Is Entirely Insulated from the Operating Circuits of This New Thermoelectric Temperature Controlling Device

the circuits of the heating element of the electric furnace.

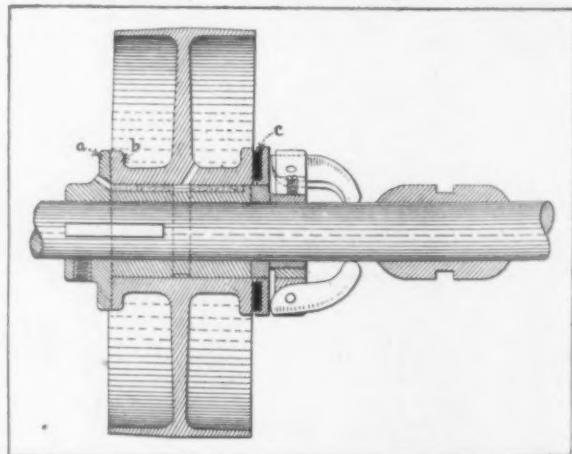
It will be noticed from the engraving of the controlling element of the thermoelectric type that the indicating arm is insulated completely from the operating circuits. The contacting device, it is pointed out, is frictionless. These thermoelectric temperature controllers can be furnished for all ranges up to 3000 deg. Fahr. They are designed for use with either base or precious metal thermocouples and are equipped with high resistance movements.

The thermometer-thermostat device for opening and closing the supply valves of gas and oil fired furnaces or for controlling temperatures in electric ovens and furnaces is also shown. It is equipped with a sensitive bulb and is connected to the special relay switch employed in connection with temperature control in electric furnaces and ovens. In the illustration both the high and low temperature contacts are shown, but when the device is used in connection with the maker's special controlling valves for both gas and air supply only one contact is required, it is pointed out. Two gas and air valves are used in connection with this device if the air is supplied at a pressure and both valves are operated simultaneously. This arrangement is relied upon to supply the proper proportions in the mixture at all times.

A Friction Clutch with Wedge Plates

A line of friction clutches which range from 2 to 20 in. in diameter has been brought out by the National Clutch Company, Fulton and Lincoln streets, Chicago. The use of two tapered plates working in opposite directions is the distinctive feature while other points emphasized are the ease of adjustment and the lubricating arrangement provided.

One of the plates *a*, which is the driving member, forms a part of the hub that is keyed to the shaft, while the other plate *b* is the fixed member and rotates freely



Two Plates Having the Surfaces in Contact Tapered Slightly Constitute a Feature of this Friction Clutch

on the hub carrying the other plate. Three longitudinal grooves are provided in the hub which run the entire width of the pulley and there is a circular groove as well. The oil travels through these grooves and provides for the lubrication of the clutch. The adjustment is obtained by loosening the set screw in the spider and turning it either to the right or left on the threaded portion of the hub.

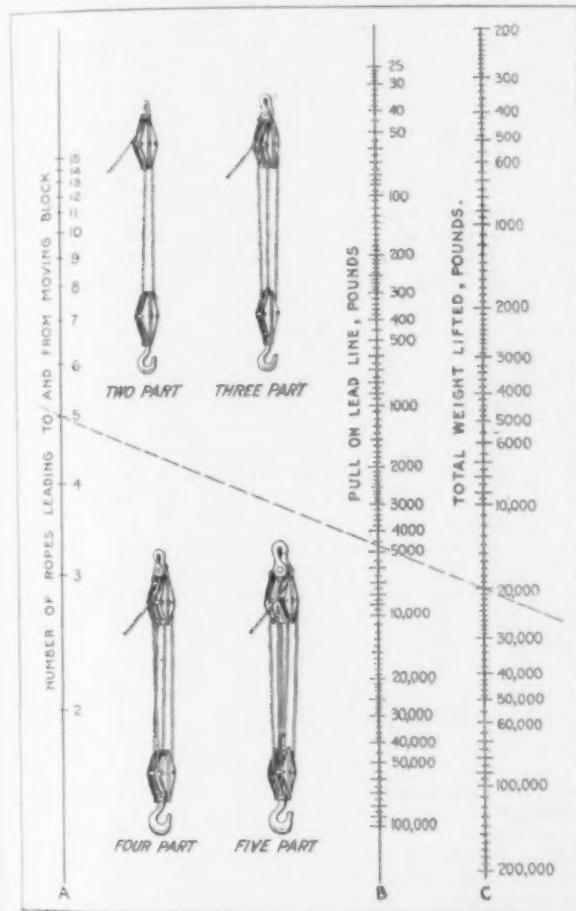
To engage the clutch the three fingers provided, two of which are shown in the accompanying drawing, are pressed against the compression plate *c*. This forces the pulley to move along the hub and brings the plates *a* and *b* together. When the clutch is first engaged the friction contact between the plates starts the machine. As the load is picked up the two friction wedge plates which work in opposite directions start to bring the two wide portions closer together, thus, it is pointed out, increasing the pulling power of the clutch up to its rated capacity.

WIRE ROPE TACKLE CHART

Diagram Enabling Calculations of Safe Load to Be Made Quickly

BY W. F. SCHAPHORST

IN the field of construction and engineering, tackle using wire rope has largely supplanted that employing Manila rope. These ropes, as used on derricks, hoists, etc., are reeved with a number of parts using single or multiple sheave blocks. The chart shown is based on the data recently published by the John A.



If Two of the Three Factors Involved in Hoisting Loads with Wire Rope Tackle Are Known, It Is a Simple Matter to Find the Other One with This Chart

Roebling's Sons Company, Trenton, N. J., and enables the third factor involved in the hoisting of loads to be determined easily if the other two are known. By laying a straight edge across the chart, as indicated by the dotted line, the pull necessary to lift any weight up to 200,000 lb. is immediately given by the column B. This chart takes into account the friction of the ropes and pulleys, which is less for a smaller number of ropes although the pull on the lead line is decreased if a larger number of ropes are employed.

If it is desired to determine what pull on the lead line is required to lift 20,000 lb. with five ropes, the graduation corresponding to 5 in column A is connected by a straight edge with that corresponding to 20,000 lb. in column C. The straight edge intersects the column B at approximately 4700, which is the pull required.

The number of parts supporting the load is determined by counting the ropes leading to and from the moving block. To arrive at stress on the lead line, the common practice is to divide the weight of the load by the number of parts of rope supporting it, but this is not correct, as it does not take into account the friction of the blocks nor the rigidity and internal friction of the rope. The maximum stress when hoisting occurs in the lead line, since this besides taking a proportion of load on a single part also takes the accumulated friction of the blocks and rope in all the other parts of the tackle. If, for example, a seven-part hoist is employed for rais-

ing a load of 35,000 lb., according to the usual practice the stress in the lead line would be 5000 lb., assuming that all parts pulled equally. This stress occurs, however, only in the becket line. The maximum stress is 6325 lb. or the product of the load, 35,000 lb., multiplied by the lead line pull factor for a seven-part tackle which is 0.1807. This stress occurs in the lead line only and is 27.5 per cent greater than the value found in the usual way.

Increase in Concrete Industrial Buildings

In a paper on "The Recent Tendencies in Industrial Building Construction," read before the American Concrete Institute by W. P. Anderson, president Ferro Concrete Construction Company, the author made out quite a case for the trend toward concrete as a material for industrial building construction. In the period 1905 to 1910 there were 7,014,218 sq. ft. of floor area of mill construction built and only 5,152,579 sq. ft. of concrete construction. But in the period of 1911 to 1916, inclusive, the area of concrete construction jumped 329 per cent to 16,926,152 sq. ft., while the mill construction showed an increase of about 10 per cent to 7,709,469. The floor area of four principal types of construction were in 1905 as follows: All wood, 262,137; mill construction, 2,470,425; concrete construction, 617,739; brick wall and steel frame, 1,117,723. In 1916 these items were: All wood, 225,081; mill construction, 1,705,785; concrete construction, 4,363,975, and brick walls with steel frame, 585,521.

Automatic Screw Counting Machine

To count out a definite number of articles and deliver them into a package is the function of a special automatic machine developed by the Reynolds Pattern & Machine Company, Moline, Ill. It is designed particularly for use in hardware manufacturing establishments



Counting Out a Definite Number of Screws as for Example Those Required for a Pair of Hinges and Delivering Them Into a Package Automatically Is the Function of This Recently Developed Special Machine

where a certain number of screws which are used by the purchaser for assembling the goods, such as hinges, etc., for example, have to be packed with each unit.

The package is set on the pad on the end of the lever below the delivery chute. When the lever is pressed the motion is transmitted through connections to an escapement that delivers the desired number of screws, in this case eight, into the package which is then removed and the operation repeated.

It is, of course, possible to deliver any desired number of screws by changing the escapement and at the present time the development of a machine to deliver screws in gross lots for use in factories is being considered.

IMPORTANT SHIPPING BILL

Authorizes Taking Over, When Needed, Vessels Building Here for Aliens

WASHINGTON, D. C., Feb. 27.—A measure of high importance to the shipbuilding industry and to many shipowners has been reported to the House by the Committee on the Merchant Marine and Fisheries with an urgent recommendation for its immediate passage. It is designed primarily to augment the American merchant marine in time of war or great national emergency and to relieve a transportation problem that has become acute as the result of the fact that the shipyards of the country are to-day building more than 675,000 tons gross of vessels for alien owners, for the most part citizens of Norway and other Scandinavian countries. Incidentally the bill will enable the President, subject to specific authorization, to take over merchant vessels for use as naval auxiliaries in time of war. The bill also regulates the purchase for the American merchant marine of the vessels of belligerent countries during a period of actual war.

To Retain Under Our Flag All Vessels Building Here

In view of the lamentable shortage of tonnage under the American flag to handle our commerce in the domestic and overseas trade, especially at a time when the United States may be compelled to take steps to enforce its rights on the high seas as a neutral nation, the Administration regards it as of the utmost importance that Congress should take steps to increase the merchant marine, and the President believes that the emergency justifies legislation that will retain under the American flag all cargo vessels now building in our shipyards for alien owners.

The House Committee has experienced great difficulty in meeting this view of the President, while observing due regard for our shipbuilding industry and the interests of aliens who, in perfect good faith, have come to this country for ships. In drafting this bill, therefore, the committee has endeavored to frame a provision that will meet a condition of war or national emergency and at the same time protect the interests of private shipbuilders and impose the least possible burden on their foreign customers. Representatives of both these interests have held frequent conferences with the recently appointed United States Shipping Board and with the House Committee, with the result that the proposed amendments to the shipping laws are understood to give reasonable satisfaction to both interests, and at the same time will take care of a situation that may become very acute any day.

To Control New Contracts With Foreign Owners

For the purpose of preventing aliens from utilizing the facilities of American shipyards during the war or other national emergency, the bill provides that every contract for the construction of a vessel in the United States made by a shipbuilder with a person not an American citizen shall, before work has been begun thereunder, be presented to the United States Shipping Board, together with the plans and specifications, and opportunity given the board, at its option, either to purchase such vessel when completed at the contract price or to make a new contract to use the facilities and space which would have been employed in the construction of such vessel in the building for the board of equivalent tonnage at an equivalent profit. A proviso of this section stipulates:

If, in case of a contract so assigned to a person not a citizen of the United States, the construction of the vessel has begun at the time this amendment takes effect, the board need not be given opportunity to make a contract for the use of such space and facilities, but during such war or emergency no vessel built under a contract thus made or assigned to a person not an American citizen may first enter upon the navigable waters of the United States unless the board has failed for 30 days after the presentation of such contracts, plans and specifications to avail itself of the opportunity to purchase such vessel or to make the new contract above referred to.

This section also makes it unlawful for any person

who has a contract with a shipbuilder for the construction of a vessel in the United States to assign such contract without the consent of the Shipping Board during a war or emergency to an alien, after the construction of such vessel has begun. The fact that a war or emergency has begun or ended is to be evidenced by a proclamation of the President.

Transfer to Foreign Flags Regulated

The fact that a large amount of tonnage in the shape of seaworthy cargo ships has been transferred to foreign flags by sale since the beginning of the European war has induced the committee to incorporate a section in the bill to this effect:

During any war or national emergency no vessel registered or enrolled and licensed under the laws of the United States or owned by any person a citizen of the United States or by any corporation, partnership or association, organized under the laws of the United States, or of any State, Territory, District, or possession thereof, shall (a) without the approval of the board, be sold, leased or chartered to any person not a citizen of the United States, or transferred to or placed under a foreign registry or flag, or (b) for such portion of such war or emergency as the President may order, such order being evidenced by proclamation, be sold, leased, or chartered to any person without the approval of the board. Such approval may be given by general or special regulations.

With a view to permitting aliens who have contracted for vessels in American shipyards to operate them in the American merchant marine, including coastwise trade, the bill provides for the organization of corporations exclusively by aliens for such purpose. Such vessels, if otherwise qualified by law, may be registered or enrolled and licensed under the laws of the United States and shall then have all the privileges of American vessels, including the right to engage in the coastwise trade. But during the existence of war or emergency they may be operated only in the coastwise trade and in voyages from the United States to foreign ports, the Shipping Board having full power to restrict the number of foreign ports of call by general or special regulation.

With a view to limiting the somewhat onerous restrictions imposed on aliens by the provisions of the bill to the actual period of a war or emergency, the bill provides:

Any vessel now building or hereafter built in the United States (the contract for the construction of which (a) was made by the shipbuilder with an alien before this amendment takes effect, or (b) if so made with any person not an alien, is assigned to an alien before this amendment takes effect), which vessel is registered or enrolled and licensed under the laws of the United States by a corporation organized as above provided, (a) may, at the end of such war or emergency, if owned by such corporation, be sold to any person not a citizen of the United States or transferred to a foreign registry or flag, without compliance with the provisions of subdivision 3 of this section and (b) may, while owned by such corporation during the existence of the war or emergency in which it first enters upon the navigable waters of the United States, be officered according to the laws of the United States or of the country of such alien. Provided, That on no vessel heretofore or hereafter registered or enrolled and licensed under the laws of the United States shall any officer be a citizen of a country with which the United States is then at war or of any ally of such country, or hold a license under the laws of such country or ally.

Another provision of the bill amends section 5 of the original shipping act, which forbids the Shipping Board or any corporation formed in pursuance of the act to purchase, lease or charter any vessel that is under the flag of a foreign country then engaged in war. The bill provides that the purchase, lease, or charter may be made "with the express consent of the President," who, it is assumed, would withhold his approval in cases where an attempted transfer might involve this country in serious international complications.

Realizing the necessity for prompt action if this important legislation is to be enacted during the present session, the Senate Committee on Commerce has authorized a favorable report on a measure similar to the House bill in the expectation that the two may be acted upon independently by the House and Senate and their provisions finally harmonized in conference committee.

W. L. C.

EASTERN LOW-GRADE IRON ORES*

Their Magnetic Concentration—Resources of New York and New Jersey

BY S. NORTON AND S. LE FEVRE

IN the West, capitalists have expended many millions of dollars developing the low-grade porphyry ores of copper. Half a dozen of these great enterprises have proved to be wonderful commercial successes. They have demanded improved crushing and concentrating machinery and consequently it has been developed.

The concentration of low-grade magnetic iron ores, separating the magnetite crystals from the gangue by the use of magnets, is a field of work in which the lessons taught by the development of the porphyry coppers can be studied to advantage. Large-scale operations, and the liberal expenditure of enough money at the start to insure the most economical operations, are the means of securing the desired results.

The Problem Involved

The problem is to utilize millions of tons, and we may safely say billions of tons, of now worthless iron-bearing rock and to produce from it 10,000,000 to 20,000,000 tons per year of high-grade ore carrying 60 per cent iron or higher; to take the lean material as found in nature, varying widely in iron content, and bring it up to a uniform standard of shipping ore. At present these ores are mined carrying from 25 to 50 per cent iron, and the shipping product is brought up to 60 or 65 per cent Fe. If future economies of operation make it possible to extend this process so that 15 per cent iron in the crude ore can be treated as a commercial success, the additional tonnage available will be enormous. A 15 per cent Fe crude ore raised to 60 per cent Fe concentrate with 5 per cent Fe loss in tailings would require 5.5 tons of crude for 1 ton of concentrates. The cost of crushing and concentration can be brought down to 12 cents per ton crude or possibly to 10 cents, and the cost of quarrying on a large scale, probably 40 cents, would be low enough to leave a profit even now. There are mountains of gabbro rock in the Adirondacks that will average 15 per cent iron in the form of magnetite crystals of good size, say $\frac{1}{8}$ to $\frac{1}{16}$ in., but the concentrate would also carry some titanium.

Magnetic Iron-Ore Resources

A thorough examination of some of the iron-ore properties and the knowledge acquired by development of extensive underground workings makes it possible to make quite definite estimates of tonnage available in certain areas, which show very large reserves.

F. S. Witherbee in his paper read before the American Iron and Steel Institute last October gave an estimate of 1,100,000,000 tons of crude magnetic ore above 30 per cent Fe available for concentration in the Adirondack region alone, not including any titaniferous ores except the one deposit at Lake Sanford. He practically confined his estimate to the area of the iron-bearing gneisses which surround the central core of later eruptives, the anorthosites and gabbros, in which the titaniferous ores are found.

There are also in New Jersey and southeastern New York large areas that give conclusive evidence of vast amounts of non-titaniferous magnetites. The map accompanying the report of the State Geologist of New Jersey for 1910, shows the area of iron-bearing gneiss rocks running northeast and southwest across the State about 18 miles wide by 50 miles long, from Phillipsburg to Greenwood Lake. In this area are located by name 366 magnetite mines that have been worked more or less. There are also 24 limonite and 8 hematite mines. These mines may easily be capable of producing an average of 1,000,000 tons each and there are probably double the number listed not opened up. Here we have 900 square miles of iron-bearing gneisses in New Jersey, or more than in the Adirondack region, with nearly as

*From a paper presented Feb. 19 at the annual meeting of the American Institute of Mining Engineers, New York City. The authors, both consulting engineers, were associated in the development of the plants at Mineville, N. Y.

much more additional in southeastern New York, reaching from the New Jersey line across the Hudson at Fort Montgomery and extending to Brewster's.

Mr. Witherbee's method of computation estimated 20 ft. thickness of ore over 10 per cent of the surface area. He afterward cut the estimate in half to be conservative, which was equivalent to 10 ft. thickness of ore on one-tenth of the surface. This would give 2,700,000 tons per square mile, or on 900 square miles in New Jersey 2,300,000,000 tons, with a goodly area in New York to fall back on to make up deficiencies.

A recent examination of a small area of 4 square miles near Sterling and Tuxedo Lakes in New York near the New Jersey line, showed ore reserves estimated at 5,000,000 tons per square mile.

Magnetic ore is found quite widely distributed, in Canada, Minnesota, California, New Mexico, New York, New Jersey, Pennsylvania, North and South Carolina, Tennessee. A detailed study of these deposits might be an interesting subject for the Bureau of Mines to follow up.

[The original paper contains a history of the development of the magnetic separator, particularly the Ball-Norton.]

The use of magnets of alternating polarity is the fundamental principle of the Ball-Norton separator and greatly increases the capacity and efficiency of the machine. Mr. Ball made the magnets, a small machine was built and taken to the Benson mines, where about 1000 tons of 63 per cent Fe ore was made, shipped to Braddock furnace and used there by James Gayley. This, we think, was the first use of magnetic iron-ore concentrates in a blast furnace.

The demonstration of the dry process of magnetic separation is the result of 14 years' work at Mineville, N. Y. Witherbee, Sherman & Co. have now in operation three mills having a combined capacity of 6000 tons per day of crude ore. The Empire Steel & Iron Company and the Ringwood Company have demonstrated what can be done with New Jersey ores. The Ringwood Company has also worked out a dry process of jigging for their tailings to recover the martite, which is non-magnetic. Martite is a hematite in composition, but is very similar in appearance and crystallization to the magnetite. Some of the magnetic ores have varying amounts of martite mixed with the magnetite.

Summary

The known and partially developed orebodies of New York and New Jersey could, if equipped with the best modern mining and milling machinery and using the best methods, produce at the present time 25,000 tons of 60 per cent iron ore per day. This can be delivered for an average freight charge of 75 cents per ton from mill to tidewater. The operating cost of production should reach the "dollar rock" ideal of the Lake Superior Copper region, and the cost of mining and milling 1 ton of crude ore should be about \$1 for underground mining when handled in large quantities.

The ratio of concentration would be 2 tons of crude per ton of concentrates for an average. There are reserves of magnetic ore sufficient to double the above production, and then last probably 100 years.

The 1916 Pig-Iron Output, 39,434,797 Tons

The special statistical bulletin No. 1, 1917, of the American Iron and Steel Institute, 61 Broadway, New York City, just received as we go to press, shows the pig-iron output of the United States in 1916 to have been 39,434,797 gross tons as compared with 29,916,213 tons in 1915 and 30,966,152 tons in 1913, until last year the record output. The estimate of THE IRON AGE on Jan. 4, 1917, was 39,450,000 tons as the output for 1916, which is very close to the Institute's figures. Of the 1916 total, 17,684,087 tons was basic iron and 14,422,457 tons was Bessemer and low-phosphorus iron. The ferromanganese output was 221,532 tons, with *Stiegeleisen* at 194,002 tons, both record figures. The pig iron made with coke as fuel was 38,844,598 tons; with anthracite or mixed anthracite and coke, 217,788 tons, and with charcoal 372,411 tons.

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EDITORS:

GEO. W. COPE

A. I. FINDLEY

WILLIAM W. MACON

GEORGE SMART

CHARLES S. BAUR, *Advertising Manager*

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The Steel Billet Market

The position and prospects of the steel billet as a market commodity are now being studied with unusual interest, as it is recognized that on account of certain peculiar conditions the unfinished steel market may have a movement of its own, apart from whatever movement may occur in the market for finished products. In some quarters it is regarded as an uncommon circumstance that buyers of billets are willing to pay almost any price for early deliveries, but show no interest whatever in making purchases for forward deliveries. This mental attitude, however, is readily understood if it be assumed that the billet market is a premium market, the forward market failing to be defined because there is no action.

As a matter of fact, billets are not particularly high relative to finished steel products. Last week's quotations f.o.b. Pittsburgh, in THE IRON AGE, for moderately early deliveries, were \$65 for billets, 3.25c. for bars and for shapes and 5c. for plates; thus billets, per gross ton, were quoted \$11.67 less than the average of bars, shapes and plates per net ton. In the past there has been a very small spread, when figured in this manner, and the tendency has been for the spread to decrease as the market underwent a general advance. In the three years 1911-12-13 the average spread was about \$3.50 per ton. The billet market, of course, is not made by demand from manufacturers of ordinary bars, shapes and plates as there is rarely a profit in such a conversion, but demand from finishing mills which make other products.

Billets are substantially as scarce as ingots or blooms, hence the billet market is likely to be established by conditions pertaining to unfinished steel in general. In some quarters in the trade the theory is entertained that market developments may bring down the price of billets before there is any general decline in finished steel prices. It is pointed out that in the past few months the production of ingots has been much larger, in proportion to the production of finished steel in the United States, than ever before. The proportion has risen through two influences, namely, the exportation of large quantities of unfinished steel and the production of great amounts of war steel, involving much larger cropping in the process of rolling than ob-

tains when ordinary commercial steel is made, and involving also the production of a large output of forging billets, which do not pass to finishing mills at all. Exports alone, of ingots, blooms, billets, slabs, sheet bars, etc., averaged 155,000 tons a month in the last four months of 1916, equivalent to a rate of 1,860,000 tons a year, against 200,000 to 300,000 tons a year prior to the war. In addition to the unfinished steel thus exported, there has been the manufacture of large rounds at rail mills and the production of forging billets for shell making in the United States. Should these movements decrease, a corresponding quantity of steel would be made available in the billet form.

The new construction program now being pushed, so far as it can be pushed with labor and materials so scarce, involves, for the near future, a much greater addition to steel-making than to steel-finishing capacity. At the worst there should be added fully 3,000,000 tons a year to our steel-ingot capacity, well before the end of this year, while the additions to finishing capacity promise to be much less.

It cannot be said, however, that a clear case has been made for a decline in billets, because the arguments cited do not take into account the fact that at present there is some idleness of finishing capacity for the simple reason that the unfinished steel cannot be secured. How important may be this counter influence can hardly be gaged, for a "census of the unemployed" among finishing mills has not been taken.

Metallography in the Steel Industry

It is not many years since steel was made without the aid of a chemist to regulate its composition. Now his assistance is indispensable. Only a few years ago the value of the microscope began to be recognized in its bearing on the constitution of steel itself, independent of its composition. While chemistry solved and still clears up many problems, the microscope is explaining many hitherto mysterious steel failures and is the direct factor in the improvement and life of many steel products. The metallographist, too, is already an indispensable factor in the steel industry. And his value is only beginning to be appreciated.

It is interesting to note that at the annual meet-

ing last week of the American Institute of Mining Engineers two sessions were devoted to metallography. Of thirteen papers directly related to steel metallurgy, seven involved the microscope and its important conclusions. Hardly a meeting of a large important technical society, related to the iron and steel industry, is now held which does not have on its program some discussion of metallographic problems.

The microscope is enabling the metallurgist and steelmaker of to-day to examine the very constitution of steel itself and how the size of the crystals affects the static and dynamic properties. It is revealing, with the aid of modern pyrometers, how these minute crystals can be made smaller or enlarged, with the consequent surprising results on properties. More accurate regulation of heat treatment, augmenting the life and strength of ordinary and alloy steels and increasing the efficiency of high-speed steels, is a most important advance credited to the microscope. A striking result of the microscopic study of steel is the conclusion that the electrical conductivity of a substance is primarily dependent upon the shape and distribution of the fundamental grains or particles comprising the substance and even upon the presence or absence of thin films of secondary material enveloping these ultimate grains. Knowledge of the structure of refractories and cement, contributed by microscopic study, is working beneficial results in those industries.

Significant is the fact that in the last year one American maker of microscopes sold over 30 microscopes with metallographic outfits to Japan with lesser consignments to other nations. The future holds out some wonderful prospects of advances and surprises in steel metallurgy and other fields.

Notes on Our Foreign Trade

Iron and steel imports and exports in the calendar year 1916 were given in THE IRON AGE for Feb. 8, pp. 378-9, from advance statistics. The full report of our imports and exports in the year is now available and furnishes means for a study of certain important details.

The poor working of the present tariff law is well exemplified. As neither a full calendar nor a full fiscal year elapsed between the date the present tariff became operative, Oct. 4, 1913, and the time the war began, about Aug. 1, 1914, comparison of results in the calendar year 1916 are naturally made with the first seven months of 1914. It may be assumed that imports for warehouse, in anticipation of the reduced duties, were cleared during the first three months of the law.

There has been a double reduction in the revenue from imports, the first reduction occurring in time of peace, increased imports yielding decreased revenue, while the second occurred through the character of imports changing, during the war, so that while they increased in volume the revenue derived decreased. The decrease before the war is shown by the following statistics:

Imports Before the War		Duties
	Imports	Collected
First Seven Months of 1912.....	\$1,033,318,464	\$183,527,822
1913.....	1,018,648,675	180,000,698
1914.....	1,140,593,373	156,640,150

Thus the new tariff effected a decrease of 15 per cent in revenue although there was an increase of 11 per cent in the imports. The average ad valorem rate of duty, on all imports, free and dutiable, decreased from 18 per cent to less than 14 per cent. The disappointment to the framers of the new law was that the imports did not increase enough to balance the decrease in rates.

Since the war started there has been a further increase in imports, accompanied by a further and large decrease in the average ad valorem rate of duty, resulting in a further decrease in revenue. The average rate in 1916 was 9.24 per cent., barely more than half the average rate under the old tariff. Imports in the first seven months of 1914 were at the rate of \$1,960,000,000 a year, while in 1916 the imports amounted to \$2,391,654,335, or 22 per cent more, and the revenue decreased from a rate of \$267,000,000 a year to \$217,589,766, or by 19 per cent.

American manufacturers have prospered of late because, on account of the war, the imports of manufactures have been greatly reduced while imports of raw and partly manufactured goods have increased. The distribution of imports, free and dutiable, in the first seven months of 1914 and in the calendar year 1916, was as follows, in percentages of total imports:

Distribution of Imports

Classification	1914, Per Cent	1916, Per Cent
Crude materials for manufacturing..	34.67	42.21
Crude foodstuffs and food animals..	12.47	10.88
Foodstuffs manufactured	13.86	14.16
Manufactures for manufacturing....	15.74	17.47
Manufactures for consumption.....	22.42	14.45
Miscellaneous	0.83	0.83
Total	100.00	100.00

Thus imports of crude materials greatly increased, while imports of manufactures greatly decreased. Any tariff that would produce these results would be very satisfactory for the purpose of conserving our industries, but it was the war, not the tariff, that caused the changes. If the total value of all imports had not increased, the revenue in 1916 would have been only \$160,000,000, almost precisely one-half the revenue that was coming in under the old tariff.

Examining our exports in the same manner, the curious fact is found that our exports of crude materials for manufacturing have increased, as compared with the period just before the war. All the classes of exports have increased, but, as the total very greatly increased, the percentages of some have decreased. The distribution is shown below, in percentages of total, the first seven months of 1914 and the calendar year 1916 being compared:

Distribution of Exports

Classification	1914, Per Cent	1916, Per Cent
Crude materials for manufacturing..	27.85	13.28
Crude foodstuffs and food animals..	6.81	7.77
Foodstuffs manufactured	12.90	11.95
Manufactures for manufacturing....	19.04	16.83
Manufactures for consumption.....	33.05	48.43
Miscellaneous	0.85	1.74
Total	100.00	100.00

The value of exports per month increased from \$172,000,000 to \$457,000,000, or 166 per cent. Thus

the proportion of crude materials could be cut in half while the total value of such materials increased. Undoubtedly the quantity decreased. Manufactures for consumption almost quadrupled in value, while the proportion to total exports increased by almost one-half.

The question has often been asked how much of the increase in our imports and exports since the war started has been due to increases in quantity and how much to increases in stated value. Nearly all the figures used in discussing the import and export trade of the United States have the dollar mark before them. Of statistics relating to quantity there is but a meager supply. In THE IRON AGE for Nov. 30, 1916, pp. 1228-9, there was a discussion of this question with respect to imports, the conclusion being that the unit cost had increased but little, the increase in total value being due chiefly to increases in quantity. In the case of exports, however, the average value per unit of weight has undoubtedly greatly increased. As somewhat suggestive of the volume of the foreign trade the following table of vessel tonnage entered and cleared has been compiled, for calendar years, the figures representing net vessel tonnage:

<i>Vessel Tonnage in Our Foreign Trade</i>			
Years Entered	Cleared	Years Entered	Cleared
1903. 31,042,823	31,335,083	1910. 41,117,686	40,732,528
1904. 29,542,508	29,718,927	1911. 44,949,080	45,095,886
1905. 32,521,236	32,343,072	1912. 48,247,520	48,374,059
1906. 35,709,613	34,986,842	1913. 53,276,992	53,798,280
1907. 38,419,196	38,259,524	1914. 48,726,978	48,207,719
1908. 38,535,510	37,867,849	1915. 49,198,546	49,967,823
1909. 39,739,218	39,064,328	1916. 51,776,744	53,150,891

In 1903, with about 31,000,000 vessel tonnage entering and clearing, the imports plus exports amounted to \$2,480,000,000. In 1916, with about 68 per cent greater tonnage, the imports plus exports amounted to \$7,873,077,924, an increase of 218 per cent. In 1903 the foreign trade per vessel ton was \$80; in 1913 it was also \$80; in 1916 it was \$150. Generally speaking, the increase in our foreign trade since the war started is wholly in value and not at all in quantity, according to the vessel statistics, but the entire increase in the trade is nevertheless not to be ascribed wholly to increases in the unit prices, as, with respect to our exports at least, there has been a redistribution whereby more goods of greater intrinsic value are being exported.

In 1903 the proportion of American vessels was one-fifth; by 1912 the proportion had risen to one-fourth, while in 1916 the proportion was 34.5 per cent.

An Item in Railroad Regulation

It is not new, in defense of the railroads, to say that if car distributors could attend to their appointed tasks instead of making reports to State boards and Federal commissions, less would be heard of car congestion. If more or less active participation in railroad management by Government officials should come about, perhaps the traffic expert would be relieved of his duties as clerk-in-waiting on investigative and judicial committees and could have some freedom to devote himself to the tasks for which he is fitted. As matters now stand the proficient in railroad problems does not have time to oversee those in his branch of the railroad organization, let alone plan himself. Whatever may be all

the reasons for the failure of the roads to buy motive power and rolling stock when they should, the system of regulation is wrong when in a detail like petitioning for a freight rate increase, a single railroad, the Pennsylvania for example, had to spend nearly a half million dollars in printing proposed tariff schedules before it was permitted its day in court.

No Large War-Time Profits

That excessive profits are to be prevented in the event of hostilities is indicated by the fact that the Council of National Defense has called on the Chamber of Commerce of the United States for assistance and advice in purchases to be made by the army quartermasters. The National Chamber recently passed a resolution providing that the basis of supply of government requirements in war and peace from private sources should be at a rate of profit so low as to preclude a profit interest in war. Secretary of War Baker, who is president of the Council of National Defense, has requested the National Chamber to appoint such local committees, through affiliated commercial organizations throughout the country, as may be necessary to co-operate with the district depot quartermasters in the purchasing of supplies now authorized by law.

The basis of profit is to be a guaranteed return of a small percentage on the book value of the assets of the company. The inevitable economic disturbance following a declaration of war will be minimized, also, to the greatest extent possible by the use of the government credit. Interest on bonds on industrial plants will be paid, according to Bascom Little, chairman of the Chamber's committee on national defense, and the holders of the shares of these companies will not, therefore, suddenly be faced with a cessation of income. It is expected that the result of a small guaranteed profit will be an instant stabilizing of industrial credit and the complete elimination of stock market speculation.

United States Huge Foreign Trade Balance

The foreign trade balance in favor of the United States since the outbreak of the European War is now over five times the net debt of the nation, according to the Bureau of Foreign and Domestic Commerce. It is more than \$5,500,000,000, whereas the report of the Secretary of the Treasury for Sept. 30, 1916, showed a net debt of \$1,058,289,751.82. The excess of exports over imports for the 12 months ended Feb. 1, 1917, amounted to \$3,315,849,955, approximately twice that for the previous 12 months, \$1,776,028,624, and eight times that for the 12 months ended with January, 1915, \$420,755,365. The total value of exports of merchandise in January, 1917, amounted to \$613,441,020, nearly double that for the corresponding month of 1916 which was \$330,036,410, and over three times that for January, 1914, namely \$204,066,603. Corresponding figures for imports in January, 1917, amounted to \$241,674,851, as against \$204,834,188 in December, 1916, and \$184,350,942 in January, 1916.

M. A. Hanna & Co., Cleveland, have issued an attractive brochure on Lake Superior iron ores, giving cargo analyses for the season 1916, with guarantees for 1917. These analyses are given in tabular form for the several mines controlled by the firm, classified under the separate ranges. A supplement to the book gives a table for figuring premiums and penalties based on general prices of Lake ores in 1917. A photographic view is inserted of the open pit mine of the Wakefield Iron Company, Wakefield, Mich., on the Gogebic range.

Economic equality between men and women employed in industry was advocated in a resolution passed by an annual conference of the labor party of Great Britain on Jan. 25. The conference also passed a resolution against the employment of black labor.

The Selling Organization of Factories*

The Sales and Engineering Forces Can Be Co-ordinated to Handle Inquiries Promptly and Give Customers the Maximum of Service

BY G. H. TWEDDELL

The selling engineer may be considered the life-sap of any manufacturing concern, as upon the results of his activities the success of the industry largely depends. The chief object in manufacturing is to effect a profit, and the source of income is contingent upon the sale of the product. The most efficient factory organization can be nullified by poor selling.

Selling Representatives

Many manufacturers seem to think that a good sales organization consists in appointing a large number of agents or travelers on commission, and further, that in consequence advertisement is unnecessary. This is a fallacy. In engineering work consulting engineers and buyers generally grow tired of interviewing representatives of this kind. What they require to see is the equivalent of a principal.

As an alternative to outlining a hypothetical selling organization, we will examine briefly an organization with which the author is associated. Fig. 1 indicates the general scheme.

The works' commercial department (of which the outside selling staff is a part) is under the direction of a general sales manager to whom the district office managers and special representatives report, through the manager of home sales. The works' correspondence department is an integral part of the commercial department, and forms a connecting link between the various district offices and the engineering departments.

The varied and technical nature of the products to be marketed calls for a large number of high class men as representatives. It is essential that the relations with customers should be closer than is necessary in many other lines of business. These same conditions require that the company's representatives should live in the same district as its customers, with the result that a system of local or what are termed district offices has been created, one in each natural market, controlling sufficient business to warrant its existence and so constituted as to meet the demands of the territory and customers it has to serve.

There are eight district offices situated in the largest towns in the chief manufacturing centers of the United Kingdom. Similarly abroad, four district offices are situated in Johannesburg, Calcutta, Bombay and Melbourne, and are supplemented with a number of agents located in territory not covered by the company's own offices. The export business is done through the office of the manager of export sales. European business is conducted through the French, Italian and Norwegian allied companies. In the case of Russia and Spain, the business is done through export agencies controlled by branch offices. The total orders secured by this force are manufactured at one works employing 9000 hands.

Work of the District Office

Each district office and works' selling representative is provided with two loose-leaf pocket-books. One of these is a series of price sheets giving the latest prices of all the standard apparatus manufactured by the company. The leaves of this book are revised and reissued from time to time by the price department as prices or standards change, or new apparatus is introduced. The

other book contains technical data referring to the standard apparatus, which are also kept up to date in a similar manner. Each district office is provided with specifications of standard apparatus, outline drawings and diagrams of connections, etc., and a proper stock of literature descriptive of the company's apparatus, so that with these aids the district office representative is able to handle all ordinary inquiries for standard apparatus without reference to the works. When the purchasers' requirements cannot be met by means of standard apparatus, or when there is some doubt in the selling engineer's mind upon this point, the inquiry is referred to the works.

Up to this point the customer has dealt with one man who has a general knowledge of his requirements, but now his case is put into the hands of experts who have specialized in the particular commodity which is the subject of his inquiry. In the case of an inquiry covering various apparatus, it is felt that it would be disconcerting and annoying to the customer to have to deal with a number of correspondents in different departments. An arbitrary rule is therefore made which determines that inquiries covering certain materials shall be dealt with by one commercial department. Any correspondence with the customer or the district office respecting this inquiry will come through that department's hands, and any information required on other items in the inquiry that do not come under that department's supervision must be obtained by it from the other departments at the works, and embodied with the other information sent to the purchaser.

The Commercial Department at the Works

Each commercial department at the works is controlled by a sales manager who has under him a staff of correspondents and one or more selling engineers. The works' selling representatives are specialists and are called in by the district offices to assist in particular cases where special knowledge is required.

For each commercial department at the works there is a corresponding technical department which gives the necessary technical information to the commercial department to transmit to the customer. Should the bid result in an order, the correspondence respecting that order is undertaken by one of the commercial departments at the works. A similar rule to that mentioned above determines which department shall handle the whole correspondence for any particular order. It is then the function of the commercial department to clear up any doubtful points and to instruct the technical department to put the work in hand in accordance with the customer's requirements. The technical departments then issue their instructions to the factory and to the drawing office for the carrying out of the work.

Besides the commercial departments mentioned above, there are the publicity and statistical departments, engaged in sales promotion, whose function it is to compile and analyze statistics, to produce catalogs and other literature describing the products of the company, and by advertising widen the market and generally co-ordinate the results obtained. A confidential bulletin is published once a month for the information of salesmen and heads of departments, in order to let them know what is going on in other branches. Also a monthly house organ is published and distributed to important purchasers, giving descriptions of the work executed by the company and articles of general interest by one or other of the experts which they employ.

A comprehensive mailing list (containing approximately 30,000 addresses) is on file. This list is section-

*From a paper on "Works Organization," presented at a meeting of the North-East Coast Institution of Engineers and Shipbuilders, Newcastle-upon-Tyne, Oct. 26. There were three parts. One devoted to the manufacturing organization was contributed by A. D. C. Parsons and reviewed in *THE IRON AGE*, Dec. 21, 1916. The second on the financial organization by Edwin L. Orde appeared in these columns on Jan. 18. The third and last part, on the selling organization, is the subject of the present review.

alized into various trades to which suitable literature and special publications are forwarded from time to time, as issued.

District Office Organization

The organization of the district office should be as simple as possible, with one head, usually known as district manager. Working under his direction are the selling engineers, erection and clerical staff. Apart from the essential requirements of honesty, reliability and intelligence, the district manager should be a good judge of human nature, and have had sufficient experience to use such judgment to advantage. An engineering education and experience is usually considered an essential, and unless a man has had such education and experience, he must have all the other qualifications remarkably well developed to be able to occupy his position successfully. He should have a thorough knowledge of the apparatus he has to sell, together with a knowledge of the customs and policy of the company.

A district office staff should be selected with care. It is the natural inclination to secure additions to the staff from the works organization, as the knowledge of the details or apparatus brought into the office by a man from the works is of great value. Such a man also is,

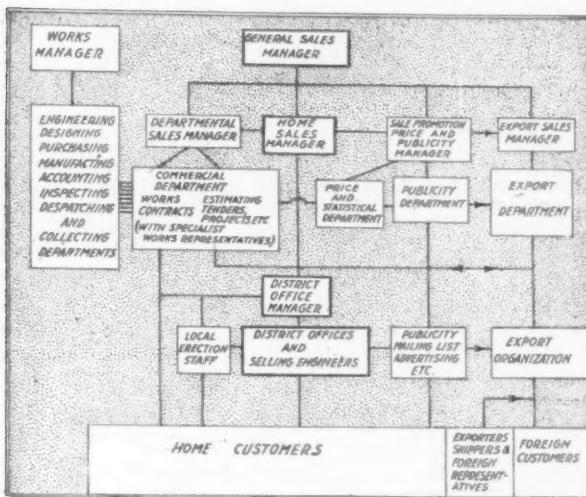


Chart of the Sales Organization of an Electrical Manufacturing Company Doing a Large Domestic and Export Business

as a rule, only selected on account of his superior intelligence, and is promoted to the district office after a more or less extended experience in the works.

The Handling of Salesmen

The following suggestions may prove useful to those who control a selling staff. The daily report forms, provided by most firms for their salesmen, should be carefully scrutinized, to counteract any tendency upon the part of a salesman to attach himself to one particular clique, to the avoidance of the more difficult and less congenial interviews. Whenever possible, an encouraging word from the director or manager should be given, as undoubtedly the present-day work of a salesman is especially hard, and the result of a succession of rebuffs is bound to reflect in the working of the man.

Where a number of selling engineers are employed, opportunities should be given for intercourse between them. The idea adopted by some firms of calling a meeting quarterly with the directors and works departmental managers is a good one. Points possibly in dispute between the manufacturing and sales side are discussed, the future policy of the company explained, new apparatus or modifications to existing products described, and the general exchange of ideas has, in the writer's experience, been found to be extremely useful.

Some men soon fall victims to the well-worn cry of "price." Where there is known to be good business obtainable, provided the quality of the product is right, i.e. the goods well up to market standard, backed by good service and prompt delivery, this cry should be

promptly stopped. It does not require a "salesman" to dispose of the cheapest materials. The price cry is really a disease, and, like laziness, requires to be effectively dealt with. If a man does not show up to advantage in the first year of his working, a different locality might with advantage be given him.

Referring to "service," a point which is often imperfectly appreciated is that nowadays customers buy not merely apparatus but service, which, besides including the apparatus, covers technical advice, guidance during erection, instructions as to operation, etc. The various items of service mentioned are not necessarily carried out by the selling staff, but by other members of the organization. Nevertheless, carelessness or incompetence in connection with any one of the services would give reasonable ground for dissatisfaction, and prejudice the prospects of securing future business.

For the Selling Engineers

The need for well-trained engineers for the commercial and selling side is becoming more and more appreciated by manufacturers. Sound technical knowledge and a considerable amount of practical training are nowadays almost indispensable for a successful selling engineer. The technical positions in engineering manufacture referred to above are as follows:

(1) The works side—comprising such positions as works and departmental managers, together with assistants in the inspection, testing, estimating and drafting departments. (2) Designers. (3) Commercial or selling engineers.

Up to a certain point the training of youths for the manufacturing and commercial sides is identical, and it is often not until the technical and practical training has been completed that an apprentice decides which side he will take up. The author is seeking to indicate what the training of the future selling engineer should be. A satisfactory training would be—after a sound, general education extending to the age of sixteen or seventeen years—a three-year period of education in engineering science at a technical college, and a similar period in practical engineering work.

Essentials of Success in Salesmanship

The selling engineer has not lacked for advice and helpful suggestions during the past few years concerning his work. Notwithstanding this, too many suggestions cannot be put before him. The following remarks are intended primarily for young salesmen, though it is hoped that some of the suggestions made may be of value as reminders to all.

The young engineer may rest well assured that there is no loss of dignity in taking up the commercial side of engineering, but a salesman failing to combine business ability with technical skill is doomed to limited advancement, if not to failure. In the more highly paid positions, men with sound commercial ability are conspicuous rather than men with high engineering knowledge.

Out and out commercialism of course is not intended to be the standard advocated, but rather a judicious blend of technical skill, with an extensive use of true business principles. Engineering, as we know it to-day, could not exist without its commercial side. It is almost axiomatic to say that excluding replacements, new machinery is installed solely for the purpose of increasing the output, improving the quality, or reducing the cost.

It is one of the first and most important duties of a selling engineer to convince the buyer that one or more of these objects are attained, otherwise the reasons for the installation disappear. The prime object of the salesman should be (1) to sell at a profit, (2) to accomplish the work required, (3) to satisfy the purchaser. If he accomplishes this, success is assured.

It is imperative that a profit should accrue from the transaction of business. One of the readiest and most certain means of assuring a profit is to sell standard apparatus. This insures the order going through without a hitch and incidentally with every chance of the delivery date being kept. Further advantages are:

- (1) The order is a definite request for a standard article and requires a minimum of supervision; possibility of errors is eliminated; tests are definite and pre-determined; and cost assured.
- (2) There is no drawing work to be done.
- (3) The engineering expenses are reduced to a minimum.
- (4) The factory organization is facilitated, tending to reduce the cost of all apparatus.
- (5) Finally, the chances of satisfying the purchaser are increased.

It is essential that the salesman should know the apparatus he is selling. If he knows the purchaser's conditions and the capacity and performance of his own plant, he will feel satisfied as to whether or not his apparatus will accomplish the work required. The selling engineer of the future should know all there is to know of the design and be trusted to take care of himself.

The true art of salesmanship consists in marketing goods (it is understood at a profit) and in such a way as to insure future preferential dealings with the customer. We are all salesmen to a degree, whether we sell machinery, our manual or mental services, or even the use of our money. Like everything else worth having, the becoming of a successful salesman requires effort and study.

Large Zinc Exports in 1916

Zinc exports from the United States as pigs, bars, sheets, plates, etc., had been predicted to have reached their maximum many months ago, still in 1916 they far exceeded any other war period. For the last quarter of that year they even excelled the rate for the first nine months. The following table, compiled from Government statistics, explains this:

Period	Gross Tons	Value
October, 1916	23,305	
November, 1916	20,759	
December, 1916	16,615	
Average last quarter, 1916	20,226	
Calendar year, 1913	6,948	\$955,667
Calendar year, 1914	57,899	8,751,576
Calendar year, 1915	112,209	33,508,787
Calendar year, 1916	184,255	59,965,314

It will be seen that the 1916 exports were nearly 30 times those of 1913, a normal period, with an expansion in value of over 60 times the 1913 period. Taking the exports for the last quarter of 1916 of 20,226 tons per month, the rate was at a volume of 242,710 tons per year. In July, 1914, the exports of zinc were only 140 gross tons and the rate for the fiscal year before the war ended with June 30, 1914, only 148 tons per month—a wonderful expansion.

Tin-Plate Exports Continue Large

Tin-plate exports show no signs of letting up. Those for 1916 were 226,944 gross tons, or nearly four times the shipments in 1913, then a record year. The following table, compiled from Government data, shows the expansion during the war:

Period	Gross Tons	Value
Calendar year, 1913	57,812	\$4,608,551
Calendar year, 1914	59,548	.....
Calendar year, 1915	154,641	.....
Calendar year, 1916	226,944	21,352,177

The monthly export rate in 1916 was 18,912 tons, against only 4817 tons per month in 1913. The increase in value in 1916 has been nearly five times that in 1913. The tin-plate output in 1912, one of the record years, was 962,971 gross tons, so that our exports in 1916 were probably from 20 to 25 per cent of the production.

The Burdett Oxygen Company will complete the erection of its Salt Lake City plant March 1, and will then be in position to furnish pure oxygen to users in that territory. This is one of a chain of plants erected by the Burdett Company, whose executive offices are in Chicago. The capacity of its Los Angeles plant has recently been increased 50 per cent.

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GREAT PRESSURE ON CONGRESS

Never Before so Many Important Bills Pending so Close to Adjournment

WASHINGTON, Feb. 27.—With less than five days of the session remaining, Congress is seeking to accomplish the almost impossible task of enacting the measures absolutely essential to the support of the Government. Never before has the legislative docket been in so backward a state. For the first time Congress has entered upon the final week of a session before the President has attached his signature to a single one of the 15 big annual appropriation bills. In addition, action is yet to be taken on the Kitchin revenue bill, the Webb bill legalizing export combinations, the Alexander-Fletcher bill authorizing the Government in time of war or national emergency to take over merchant vessels in course of construction, including those building for foreign account, and the Flood bill appropriating \$100,000,000 to enable the President to arm merchant vessels and to insure them and their cargoes against loss or damage. While to the inexperienced observer an extra session seems inevitable, it is still among the possibilities that the really essential legislation may be rushed through. If the end of the session comes before the leaders of both parties, in the Senate especially, are satisfied that the Executive proposes to carry out a firm policy that will protect American commerce and relieve the export embargo, which has already produced a shortage of manufacturing materials and food at many points in the eastern part of the country, and if it should be deemed desirable that Congress should remain in session until the crisis is past, a sufficient number of supply bills will probably be held up to force an extra session. If, on the other hand, the President's attitude is satisfactory to the leaders, and especially if he is content with the powers Congress is willing to confer upon him, the calendars of both houses will yet be cleared and plans made for a nine months' recess.

The Administration is bringing all possible pressure to bear in both houses for the passage of the Alexander-Fletcher bill amending the act creating the Shipping Board so as to enable the Government to increase the merchant marine and especially to enable American shipowners to monopolize the construction facilities of our shipyards in time of war. This bill, the details of which are described in another column, is now on the calendar of both houses with urgent reports from committees and is regarded as a highly important item in the war emergency program devised by the President's Cabinet.

Nothing short of an undisguised filibuster can prevent the enactment of the annual army and navy appropriation bills, although it is conceded they will have to be rushed through without anything like the consideration their importance demands. Both these measures carry many million dollars more than any similar bills in the history of the country, and the naval bill, especially, is loaded down with a "rider" in the shape of an extraordinary provision authorizing the President to commandeer the shipyards and munitions plants of the country "in time of war or national emergency." There is considerable opposition to this "rider" in both houses, based largely on the ground that both shipbuilders and munitions makers have already voluntarily pledged their support to the Government in any emergency that may arise and that, therefore, the commandeering proposition is unnecessary and would hinder rather than aid the authorities in any serious crisis.

The friends of the Webb bill legalizing export combinations will not admit its defeat, but insist that it will be passed by the Senate and concurred in by the House before adjournment. Senator Pomerene of Ohio, who reported it from the Senate Committee with certain amendments suggested by him, is very hopeful that it can be forced through in the last hours of the session.

Senator Newlands of Nevada, chairman of the Senate Committee on Interstate Commerce, has made several unsuccessful attempts within the last two or three days to secure an agreement for the considera-

tion of the bill increasing the size of the Interstate Commerce Commission and authorizing its division into several sub-commissions in order to expedite the public business. This measure has already passed the House and has been reported by the Senate Committee without important amendment, so that it will not be necessary to refer it to a conference committee if passed by the Senate; hence Senator Newlands hopes to bring it to a vote in time to insure its final passage.

W. L. C.

Baldwin Locomotive Earnings

The sixth annual report of the Baldwin Locomotive Works, for the year ended Dec. 31, 1916, shows net profits of \$2,619,465, or about \$200,000 less than for the year 1915. After deducting \$1,400,000 paid as dividends on the \$20,000,000 of preferred stock there was a surplus of \$1,219,465. This result is arrived at after making deductions of \$6,825,175 as follows: Depreciation, \$800,000; amortization of machinery, \$2,563,050; net value of Eddystone buildings, \$2,864,321, and maintenance of Eddystone buildings, \$597,803. In 1914 only \$15,000 was charged off and in 1915 only \$40,000. Apparently the whole Eddystone plant, including munition-making machinery, has been charged off the books. If the extraordinary charges had not been deducted the net earnings would have been equal to over 37 per cent on the common stock. The total surplus shown by the consolidated balance sheet of the Baldwin Locomotive Works and Standard Steel Works Company is \$11,227,134.

President Alba B. Johnson reports that contracts for locomotives and other regular work were completed and shipped amounting to \$33,605,024, and contracts for shells and other special work amounting to \$25,614,033, making a total production of every kind of \$59,219,057, against \$22,083,011 in 1915. He also says:

"The eventual utilization for locomotive construction, of the buildings now leased to the Eddystone Ammunition Corporation, and the Remington Arms Company of Delaware, when vacated by them, will release corresponding space in the Philadelphia shops. The problem of finding suitable employment for this space has received careful consideration. It is desirable to utilize it in a line of manufacturing less subject to variations of demand than railroad equipment. The Southwark Foundry & Machine Company, located at Washington Avenue, between Fourth and Fifth streets, has developed a successful business in constructing hydraulic machinery, internal combustion engines and similar machinery. The demand for its product exceeds its manufacturing capacity. There promises to be a large demand for its Southwark-Harris internal combustion engine of the Diesel type. After investigation by a committee of your board, it was determined to purchase the common stock of this company, amounting to \$650,000, and to obtain an option on its preferred stock and bonds.

"The locomotive business at the beginning of 1917 is unprecedentedly favorable."

Locomotive Orders

Orders for locomotives in the past week have been 61 and inquiries 55. The Baldwin Locomotive Works will build 56 locomotives for the Lehigh Valley. The Rock Island is inquiring for 30 locomotives and the Grand Trunk for 25. Up to Feb. 24 it is estimated that 287 locomotives have been ordered in that month which with the 807 credited to January make the total for the year to Feb. 24 at 1094 locomotives. This total contrasts with 770 locomotives ordered in the first two months of 1916. Of the total ordered thus far this year 827 are for domestic use.

Consumption of aluminum in the United States in 1916 is estimated by the U. S. Geological Survey at over 121,000,000 lb., based on statistics for the domestic production for the year and the imports for nine months. This is an increase of more than 21 per cent over the consumption in 1915. Consumption of secondary aluminum as obtained from scrap materials is not included.

Judicial Decisions

ABSTRACTED BY A. L. H. STREET

MODIFIED ACCEPTANCES OF OFFERS TO SELL.—An offer to sell "sheets for shovels, as per sample submitted, 10,000 pcs. No. 20, 16 x 18½ in., at \$3.50 per 100 lb.; 3000 to 4000 lineal feet No. 24, 14 in. wide by approximately 10 ft., \$3.25 per 100 lb., f. o. b. mill, with freight allowed to Glens Falls, N. Y., terms 2 per cent for cash 10 days; 30 days net," was not converted into a contract of sale by the customer's order for "10,000 pcs. No. 20, 16 x 18½ in., at \$3.50 per 100 lb.; 5000 pcs. No. 20, 13 x 14 in., at \$3.50 per 100 lb.; 5000 lineal feet No. 24, 14 in. wide, at \$3.25 per 100 lb.; 2500 lineal feet No. 24, 11 in. wide, at \$3.25 per 100 lb. The gage steel may come in 6, 8 or 10 ft. lengths. . . . Terms, 2 per cent 10 days, or net 30 days on arrival of car. . . . These prices are all f. o. b. Glens Falls, N. Y." When the acceptance of an offer does not conform to the terms of the offer, it merely amounts to a counter offer, with no binding effect until acceptance by the other party. Since the order above mentioned called for different quantities of steel and different sizes, for different terms of payment, and for a different place for delivery f. o. b. from the terms stated in the offer, there was no contract binding the offerer to deliver. (New York Supreme Court, Appellate Division, Glens Falls Lumber Company vs. Joseph T. Ryerson & Son, 162 New York Supplement, 427.)

ASPECTS OF PATENTS.—Even though every element of a patented combination covering a mechanical device be old, there may still be patentable invention if by the combination a new and useful result be produced, or an old result in a new and materially better way. (United States Circuit Court of Appeals, Sixth Circuit, Frey vs. Marvel Auto Supply Company, 236 Federal Reporter, 916.)

PHASES OF CARRIERS' LIABILITY.—When goods are shipped to a customer under a bill of lading drawn to the seller's order and attached to draft drawn on the buyer for the price, and the draft and bill of lading are returned, that is sufficient notice to the seller of non-delivery to charge him with knowledge that the goods are being held by the delivering carrier in the capacity of warehouseman, as authorized by the terms of the bill of lading on the consignee failing to remove the goods within 48 hr. after notice of arrival. The Federal statute which makes an initial carrier of a through interstate shipment liable for loss or injury occurring on the line of a connecting carrier does not make an initial carrier liable for any breach of duty on the part of the final carrier as warehouseman. (New York Supreme Court, Appellate Division, Dodge & Dent Mfg. Company vs. Pennsylvania Railroad Company, 162 New York Supplement, 549.)

VALIDITY OF DEBTOR'S CONVEYANCES.—A conveyance made by a debtor to his wife, or other relative, cannot be regarded as in fraud of creditors if at the time he was solvent and the conveyance did not make him insolvent; the fact that he afterward became insolvent cannot render the conveyance fraudulent and therefore invalid. (St. Louis Court of Appeals, Christopher-Simpson Iron Works Company vs. Bajohr, 190 Southwestern Reporter, 615.)

RIGHTS UNDER SALES CONTRACTS.—An agreement for sale of goods to be delivered in "reasonable instalments," as required by the purchaser, obligates him to make his demands at reasonable times and for reasonable quantities and binds the seller to make deliveries within reasonable times on such demands. A buyer's acceptance of delivery after the seller has failed to make it within proper time waives any right of the purchaser to cancel the contract on account of the delay but does not waive his right to recover damages sustained through the seller's default. A buyer did not waive his claim for damages for delayed delivery by agreeing to accept the goods if the seller would deliver within a short time, after the latter had been in default several months. (United States Circuit Court of Appeals, Second Circuit, Frankfurt-Barnett Com-

pany vs. William Prym Company, 237 Federal Reporter, 21.)

INFRINGEMENT OF PATENTS.—A patent for a machine having been sustained by the courts as covering a combination of old elements producing a new and useful result, or an old result in a more facile, economical, and efficient manner, an infringer cannot avoid liability for the infringement because each specific portion of its gearing device was different from the specific parts on plaintiff's device. (United States District Court, Southern District of Iowa, Grinnell Washing Machine Company vs. Clarinda Lawn Mower Company, 237 Federal Reporter, 98.)

BLOOD POISONING AS ACCIDENT UNDER COMPENSATION ACT.—A workman, who died from blood poisoning resulting from his finger being badly pinched by a moving iron girder, died from an injury sustained in the course of his employment, within the provisions of the Michigan workmen's compensation act, entitling his dependent relatives to an award under that law. (Michigan Supreme Court, Buhse vs. Whitehead & Kales Iron Works, 160 Northwestern Reporter, 557.)

ADVERTISING COURT DECISIONS.—A manufacturer who has obtained a court decree sustaining his right to enjoin a competitor from infringing a patent will not be restrained from issuing circulars to the trade in good faith, stating the conclusions of the court, although the statements may be somewhat inaccurate and strongly expressed. (United States Circuit Court of Appeals, First Circuit, National Metal Molding Company vs. Tubular Woven Fabric Company, 236 Federal Reporter, 745.)

CONTRIBUTORY NEGLIGENCE OF MACHINIST.—Plaintiff, an experienced machinist employed in defendant's factory, was directed to make a die and punching appliance to be inserted in riveting apparatus operated by compressed air. Although the machine was operated while suspended from a crane, plaintiff's repair work required him to lower it to the floor of the shop, where it rested on blocks and against a pillar. After doing his work, and while the machine was still on the floor, plaintiff turned on the air to see if the apparatus was in proper working order. This caused it to fall upon him, whereby he was injured. Held, in a suit brought to recover damages on account of the accident, that plaintiff, having knowledge of the condition in which the machine stood, and not having been directed to operate it, was guilty of contributory negligence, relieving defendant from liability. (United States Circuit Court of Appeals, Seventh Circuit, Neuman vs. Vulcan Mfg. Company, 236 Federal Reporter, 721.)

LIABILITY FOR FREIGHT CHARGES.—The shipper of freight is primarily liable for the freight charges, so far as the carrier is concerned, but the consignee may be held where he accepts the shipment and pays part of the charges. A carrier may lawfully refuse to deliver goods until all the transportation charges are paid. (Springfield, Mo., Court of Appeals, Yazoo & Mississippi Valley Railroad Company vs. Picher Lead Company, 190 Southwestern Reporter, 387.)

WHAT CONSTITUTES BREACH OF CONTRACT BY SELLER.—A contract for sale of goods at a fixed price, "cash less 1½ per cent 10 days," gave the seller no right to attach the bill of lading to draft on the buyer for payment of the agreed price, less the discount, 10 days after sight, and where the seller insisted on acceptance of the draft the buyer was entitled to treat the contract as repudiated and to refuse to accept delivery, although the seller afterward offered to waive acceptance of the draft. (Maryland Court of Appeals, Hazel Hill Canning Company vs. Roberts Brothers, 99 Atlantic Reporter, 424.)

RIGHT TO RECOVER COMMISSION FOR SALE.—Plaintiffs having agreed to buy goods on condition that a commission be allowed their friend, a selling agent, although he did not negotiate the sale, are entitled to recover the commission for the benefit of such third person on defendant seller refusing to pay it. (Georgia Supreme Court, Jordan & Phillips vs. Dixie Culvert & Metal Company, 91 Southeastern Reporter, 68.)

Iron and Steel Markets

FOREIGN DEMAND KEEPS UP

High Prices for Shell Steel and Plates

Pig Iron Higher and Wire Soon to Be—Agricultural Buying—Shipping Improved

Pig iron continues to hold the spotlight. The spurt which the car congestion gave to prompt delivery buying two and three weeks ago was accentuated in the past week by still higher and more widely divergent prices. Dependent largely on the present unusual situation, prices are sooner or later expected to come more nearly in line with contract levels. Interference with contract shipments has affected steel making as well as foundry iron.

With every day that much nearer the final removal of the snow barrier and with the improvement noted in car movements, industry is again looking forward, although rail shipping questions are still the greatest concern. Destruction of shipping by submarines has not yet been a factor. That stocks at seacoast terminals may ultimately check operations at mills is regarded as so remote as not yet to warrant consideration.

What is noteworthy in the international situation is an inflow of inquiries which shows no diminution. Coupled with a heavy domestic demand and generally low stocks in the plants of consumers, some strength is given to the talk of still higher prices for finished steel.

Buying for the Government's preparedness needs goes on slowly, waiting largely the disposition of the appropriation bills now before Congress. It is practically established that the Midvale Steel & Ordnance Company will provide facilities for making 16-in. navy guns, and probably \$2,000,000 will be expended for the additional equipment.

Some fresh sidelights on the domestic situation may be briefly summarized: Numbers of blast furnaces have sold their entire output into October. Pig-iron contracts are reported covering shipments extending into the first half of 1918. It appears that some 250,000 tons of steel bars for the agricultural implement manufacturers have been closed for the last half. Fully 300,000 tons of plates, it is estimated, could be sold on domestic account for delivery through 1918. Fair sized lots of boiler tubes for use a few months hence have sold at 20 per cent above going prices, which represent themselves unusually high profits.

Good sized quantities of wire and wire nails have been sold at \$3 per ton above present general levels, and an advance of at least this amount is expected before the end of the week. Steel bars for delivery in a few months are difficult to get at less than 3.50c., Pittsburgh basis; structural material is also somewhat stronger and there is talk of even higher prices for ordinary tank plates than 5c. per lb. A demand for high-carbon rods for Government needs is expected; sales of this product have been

made at \$90 to \$110 per ton. The notable development of the Westinghouse interests at Essington, Pa., calls for the largest list of machine tools appearing in years.

Semi-finished steel shows some signs of easing. Prices for prompt shipment billets are well sustained, but the additional steel-making capacity coming into operation as the year progresses is perhaps the occasion for the expectation of a revision on deferred delivery purchases. The canning trade is cutting down its contracts for the last half, partly, it is stated, because tin plate is so high, but the tin plate demand makes this no factor.

For export, 15,000 tons of shell steel billets has been sold by one mill for delivery after June at no less than 5c. per lb. A leading open-hearth interest, in addition to 200,000 tons now under contract, has taken 75,000 tons for the last quarter, as has another steel producer, these billets, it is understood, going for \$85 at the mill. Besides 150,000 base boxes of tin plate for Italy, fully that much is wanted by China. Of the Russian barb wire inquiry, which has not yet been wholly closed, 30,000 tons is desired as soon as possible, while 75,000 tons will be taken in the latter part of the year. Another pig iron inquiry has come from Italy for 30,000 tons for March-June delivery.

A price of 6c. for six months shipment extending through the first quarter of 1918 has been accepted in the sale of 25,000 tons of ship plates by one mill in the last two weeks. Japan has bought 13,000 tons from an Eastern mill at slightly under 6c. for the first half of 1918 and negotiations are under way for 10,000 tons at 6c. for the second quarter of next year. Japan's present unsatisfied inquiries amount to some 50,000 tons. In addition to the five 15,000-ton boats placed with the Bethlehem Steel Company by the Cunard Line, three 7500-ton freighters are to be built for the same owners at a Tacoma yard.

Pittsburgh

PITTSBURGH, PA., Feb. 27, 1917.

The car situation is much better, but is still far from being satisfactory to shippers or to the railroads themselves. On Monday the supply of cars in the Connellsville coke district was 80 per cent, while to-day it is down to 50 per cent, and by the last of this week it will likely be lower. There are cases where coke shipped weeks ago out of the Connellsville region destined to Valley furnaces has not yet been delivered. The freight movement on the Pennsylvania Railroad for the past 10 days, both east and west, was more satisfactory than for several months, the accumulation at many points having been almost entirely removed. Much of the remaining accumulation of freight is due to the fact that the railroad will not allow its cars to be loaded for delivery on other roads, while others are following the same policy. The fuel situation is also better and it is believed the famine in supply of coal is largely over. About a week ago run-of-mine coal sold readily at \$7 per ton, but to-day it is \$5 or less. February has made a sorry showing in the output of pig iron, steel and finished materials. It is considerably

A Comparison of Prices

Advances Over the Previous Week in Heavy Type, Declines in Italics
At date, one week, one month, and one year previous

For Early Delivery

Pig Iron, Per Gross Ton:	Feb. 28, Feb. 21, Jan. 31, Feb. 23,			
	1917.	1917.	1917.	1916.
No. 2 X. Philadelphia...	\$33.00	\$32.00	\$30.50	\$20.00
No. 2, Valley furnace...	35.00	33.00	31.00	18.25
No. 2, Southern, Cin'ti...	28.90	27.40	26.90	17.90
No. 2, Birmingham, Ala...	26.00	24.50	24.00	15.00
No. 2, furnace, Chicago*	33.00	33.00	30.00	18.50
Basic, del'd, eastern Pa...	30.50	30.50	30.00	19.50
Basic, Valley furnace...	30.00	30.00	30.00	17.75
Bessemer, Pittsburgh...	35.95	35.95	35.95	20.70
Malleable Bessemer, Ch'go*	33.00	33.00	31.00	19.00
Gray forge, Pittsburgh...	31.95	31.95	29.95	18.45
L. S. charcoal, Chicago...	35.75	35.75	31.75	19.75

Rails, Billets, etc., Per Gross Ton:

Bess. rails, heavy, at mill	38.00	38.00	38.00	28.00
O-h. rails, heavy, at mill	40.00	40.00	40.00	30.00
Bess. billets, Pittsburgh...	65.00	65.00	65.00	35.00
O-h. billets, Pittsburgh...	65.00	65.00	65.00	35.00
O-h. sheet bars, P'gh...	65.00	65.00	65.00	35.00
Forging billets, base, P'gh...	90.00	90.00	85.00	55.00
O-h. billets, Phila....	65.00	70.00	60.00	42.00
Wire rods, Pittsburgh.....	80.00	80.00	75.00	50.00

Finished Iron and Steel,

Per Lb. to Large Buyers:	Cents.	Cents.	Cents.	Cents.
Iron bars, Philadelphia...	3.400	3.159	3.159	2.409
Iron bars, Pittsburgh....	3.25	3.25	3.25	2.25
Iron bars, Chicago.....	3.00	3.00	3.00	1.90
Steel bars, Pittsburgh....	3.25	3.25	3.25	2.50
Steel bars, New York...	3.419	3.419	3.419	2.669
Tank plates, Pittsburgh...	5.00	5.00	4.50	2.75
Tank plates, New York..	5.169	5.169	4.669	3.169
Beams, etc., Pittsburgh...	3.25	3.25	3.25	2.25
Beams, etc., New York...	3.419	3.419	3.419	2.419
Skelp, grooved steel, P'gh	3.50	3.25	2.85	2.00
Skelp, sheared steel, P'gh	3.75	3.50	3.00	2.10
Steel hoops, Pittsburgh...	3.75	3.75	3.25	2.50

*The average switching charge for delivery to foundries in the Chicago district is 50c. per ton.

less than in January, and in times like these, when the pressure on the mills for deliveries is so strong, even a small falling off in output is severely felt. Conditions in the steel trade show no material change, the market being strong on everything and mills, as a rule, further behind in deliveries, due to the bad car situation, than they were a month ago. There were no material changes in prices in the past week, but an advance of at least \$3 per ton on wire products will likely be announced before this week is out. Export inquiry is still heavy, and some shipments of pig iron, semi-finished steel and finished steel are being made when it is possible to secure permits, which for some time have been hard to obtain. Large purchases of barb wire have recently been made by France, Italy and the Orient, and the export demand for tin plate from Asia and Italy is active.

Pig Iron.—The local pig-iron market has been quite active. Most of the buying has been in basic iron by consumers who are not getting deliveries on that bought some time ago, and are compelled to come in the market and pick up what they can for prompt shipment. We note one sale of 1000 tons, another of 1200 tons, one of 1500 tons and another of 5000 tons, all basic, for prompt shipment at \$30, Valley furnace. Recently there was a sale of 3000 tons of basic at \$29.50, Valley furnace, made by a dealer to a dealer, but the iron was resold to a consumer at the full price of \$30, furnace. There are no large lots of Bessemer iron being sold, but small lots bring up to \$36, Valley furnace. We note one sale of 300 tons, one of 500 tons and another of 750 tons of Bessemer for prompt shipment at \$36 at furnace. There has been some buying of foundry iron for the last half, three or four fairly large lots of No. 2 having been sold for such delivery at \$35, furnace. On small lots of No. 2 foundry for prompt shipment \$36 and even as high as \$37 have been done. Like Bessemer and basic, the supply of foundry iron over this year still unsold is said to be limited. It is said that a recent survey of the Western pig-iron market was made by the National Pig Iron Association, and it was found that less than three months' output of the furnaces on Bessemer, basic and foundry iron is unsold. The Standard Sanitary Mfg.

Sheets, Nails and Wire,	Feb. 28, Feb. 21, Jan. 31, Feb. 23,			
	1917.	1917.	1917.	1916.
Per Lb. to Large Buyers:	Cents.	Cents.	Cents.	Cents.
Sheets, black, No. 28, P'gh	4.75	4.75	4.50	2.60
Sheets, galv., No. 28, P'gh	6.75	6.75	6.25	4.75
Wire nails, Pittsburgh...	3.00	3.00	3.00	2.30
Cut nails, Pittsburgh....	3.70	3.70	3.50	2.20
Fence wire, base, P'gh...	2.95	2.95	2.95	2.15
Barb wire, galv., P'gh...	3.85	3.85	3.85	3.15

Old Material, Per Gross Ton:

Iron rails, Chicago.....	\$27.00	\$27.00	\$27.00	\$17.25
Iron rails, Philadelphia...	28.00	28.00	28.00	19.50
Carwheels, Chicago.....	18.00	18.00	18.50	13.50
Carwheels, Philadelphia...	20.50	20.50	20.50	16.50
Heavy steel scrap, P'gh...	22.00	21.00	22.00	17.00
Heavy steel scrap, Phila...	23.00	20.00	20.50	16.50
Heavy steel scrap, Ch'go...	22.25	22.00	21.00	14.75
No. 1 cast, Pittsburgh...	20.00	19.00	19.00	15.25
No. 1 cast, Philadelphia...	20.00	20.00	20.00	17.00
No. 1 cast, Ch'go (net ton)	16.00	16.00	15.50	12.75
No. 1 RR. wrot. Phila....	27.00	25.00	26.00	21.50
No. 1 RR. wrot, Ch'go (net)	24.00	24.00	23.50	14.75

Coke, Connellsville, Per Net Ton at Oven:

Furnace coke, prompt...	\$12.00	\$12.00	\$8.50	\$3.50
Furnace coke, future...	7.00	7.00	6.00	2.50
Foundry coke, prompt...	13.00	13.00	10.00	3.50
Foundry coke, future...	7.00	8.00	7.00	3.25

Metals,

Per Lb. to Large Buyers:	Cents.			
	Cents.	Cents.	Cents.	Cents.
Lake copper, New York...	36.50	36.00	33.00	27.37½
Electrolytic copper, N. Y.	36.50	36.00	33.00	27.25
Spelter, St. Louis.....	10.50	10.50	10.50	21.25
Spelter, New York.....	10.75	10.75	10.75	21.50
Lead, St. Louis.....	9.62½	9.25	8.00	6.22½
Lead, New York.....	9.75	9.50	8.15	6.30
Tin, New York.....	50.50	48.75	45.75	42.20
Antimony (Asiatic), N. Y.	31.00	30.00	23.00	44.00
Tin plate, 100-lb. box, P'gh	\$7.50	\$7.50	\$7.00	\$4.00

Company has bought about 5000 tons of Southern No. 2 iron at \$24, Birmingham, part for delivery at its Louisville works and the remainder for its New Brighton and Pittsburgh works. No. 2 Josephine stack of Corrigan, McKinney & Co., at Josephine, Pa., and their Scottsdale furnace at Scottsdale, Pa., both of which have just been relined, are still idle, the firm having been unable to accumulate enough coke to warrant starting. Both are expected to resume within the next 10 days. The average prices for Bessemer and basic iron for February will be made up on Thursday, March 1, and will be \$35 for Bessemer and \$30 for basic, Valley furnace, the same prices as ruled during January. We quote standard Bessemer iron, \$35; basic, \$30 to \$31; gray forge, \$31 to \$32; malleable Bessemer, \$31 to \$32, and No. 2 foundry, \$35 to \$36, prices on the latter depending on the deliveries wanted and the quantity, and all at Valley furnace, from which the freight rate to Pittsburgh or Cleveland is 95c. per ton.

Billets and Sheet Bars.—As noted in this report last week a little more steel in the form of billets and sheet bars is available for prompt delivery to consumers on account of railroad embargoes being on at some plants to which this steel was to have been shipped. Sales have been made of fair-sized lots of soft Bessemer and open-hearth billets and sheet bars at \$65 at mill. It develops that several western Ohio steel makers have sold large quantities of shell steel billets for export this year. One leading open-hearth interest has taken 20,000 tons per month, January to October, of shell billets and 25,000 tons per month for the last quarter, and another has taken the same quantity. It is said these billets were sold at about \$85 at mill. The contracts contain a clause that in case the war ends other material is to be substituted, so that the full tonnage will be taken out. The price to be charged for any substituted material is to be the same as was in effect at the time the contracts for the shell billets were placed. A local interest is also reported to have taken a large quantity of shell billets, for delivery all over this year, the amount being given as considerably larger than in the above-mentioned contracts. Deliveries of billets and sheet bars by the steel mills to consumers in the past two weeks have been bet-

ter, but none of the sheet or tin-plate mills is yet getting steel as fast as it is needed. A good deal more steel capacity will come on the market by July 1, a number of open-hearth furnaces now being built being expected to be ready by that time. Several consumers still have open orders out for billets and sheet bars at \$65 at mill, and have been able to obtain a limited supply at this price. We quote soft Bessemer and open-hearth billets and sheet bars at \$65 to \$70 per ton, maker's mill, Pittsburgh or Youngstown; forging billets, \$90 to \$95 for sizes up to but not including 10 x 10 in., and for carbons up to 0.25.

Ferroalloys.—It is said consumers of ferromanganese are now pretty well covered over the first half, and the demand for prompt material has quieted down. Some large consumers placed quite heavy orders for English 80 per cent ferromanganese for delivery over the last half prior to the advance from \$164 to \$185 at seaboard. However, there are no guarantees as to deliveries on these contracts, and there is a good deal of doubt as to whether the material will be shipped, unless the war should end in the meantime. The famine in 50 per cent ferrosilicon is still on, and small lots continue to be sold for spot shipment at \$225 up to \$250 per ton. Spiegel-eisen also continues scarce, and producers are asking higher prices. We quote domestic 80 per cent ferromanganese for prompt shipment at \$275 to \$300 per ton at furnace, and English 80 per cent at \$185, seaboard, for last half delivery. We quote 18 to 22 per cent spiegel-eisen at \$65 to \$70 and 25 to 30 per cent at \$75 to \$85, delivered. We quote 9 per cent Bessemer ferrosilicon at \$45 to \$46; 10 per cent, \$46 to \$47; 11 per cent, \$47 to \$48; 12 per cent, \$48 to \$49; 13 per cent, \$49.50 to \$50.50; 14 per cent, \$52; 15 per cent, \$54, and 16 per cent, \$56.

Structural Material.—Inquiry continues fairly active, but no large jobs were placed in the past week. The Jones & Laughlin Steel Company has taken about 300 tons for cooling beds for the new open-hearth steel plant of the Trumbull Steel Company, at Warren, Ohio. The John Eichleay, Jr., Company has taken 1300 tons for the new Union Station at Richmond, Va. The Pennsylvania Railroad has distributed about 1600 tons of bridge work among three independent shops. The Carnegie Steel Company's price on beams and channels up to 15 in. remains at 3.25c. at mill, with no promise of delivery, and when the Jones & Laughlin Steel Company quotes on specific work only, its prices range from 3.25c. to 3.50c., depending entirely on the quantity and the deliveries wanted. Small lots of beams and channels from warehouse bring 4c. to 5c., depending on the quantity.

Plates.—No steel car orders were placed in the past week, and the new inquiry is quiet. One mill has sold in the past week about 1200 tons of $\frac{1}{4}$ -in. and heavier plates for delivery in six to eight weeks at 4.75c. at mill. The Carnegie and Jones & Laughlin Steel companies are practically out of it for plates for this year. The latter interest is quoting 3.75c. to 4c. on universal plates for such delivery as it can make. We quote $\frac{1}{4}$ -in. and heavier sheared plates at 3.75c. at mill for indefinite delivery, 4.50c. to 4.75c. at mill for fairly prompt shipment and 5c. to 5.25c. for small lots at mill. It is said ship plates would readily bring 5.50c. to 6c. at mill for delivery within the next year or 15 months.

Steel Rails.—Only small routine orders are being placed for standard sections for delivery in 1918. The Carnegie Steel Company is about sold up on standard section rails, not only for this year, but for nearly all of next year. The demand for light rails is moderately active and prices are firm. We quote light rails as follows: 25 to 45 lb., \$50; 16 to 20 lb., \$51; 12 and 14 lb., \$52; 8 and 10 lb., \$53, in carload lots, f.o.b. mill, with usual extras for less than carloads. Standard section rails of Bessemer stock are held at \$38, and open-hearth \$40 per gross ton, Pittsburgh.

Sheets.—The available supply on all grades for delivery prior to July 1 is limited, and steadily getting less. The leading interest is entirely out of it, and others report they have no large quantity of sheets for delivery in the second quarter and none at all for this

quarter. The new demand in the past week or two has been very heavy and, with the mills sold up so well, higher prices seem likely. The car situation is better, and the large stocks of sheets piled up in warehouses recently were reduced to some extent in the past week. Specifications against contracts are active, but none of the mills is able to deliver sheets to customers as fast as they are needed. In fact, several of the larger interests have sent out lengthy letters to their customers explaining why they are not getting deliveries of sheets as promptly as they should. We quote blue annealed sheets, Nos. 3 to 8, 4.75c. to 5c.; box annealed, one-pass Bessemer cold-rolled, No. 28, 4.75c. to 5c.; No. 28 galvanized, 6.50c. to 7c.; No. 28 black plate, tin-mill sizes, 4.50c. to 4.75c.; all f.o.b. mill, Pittsburgh. These prices are for carloads and larger lots, for shipment over the next two or three months. For more prompt delivery higher prices would likely be asked.

Tin Plate.—The bulk of the consuming trade in tin plate is covered for all of this year and little remains to be sold. In some cases consumers are cutting down materially their contracts for the second half compared with what they placed for the first half. The canners have a hard proposition to face this year, with the price of tin plate so high. Should there be a shortage of vegetables consumers would likely cut down consumption materially. For this reason canners are not contracting for as much tin plate for second-half shipment as for first half. Inquiries are in the market for 100,000 boxes or more of tin plate for shipment to Italy and to Asia, and the general export inquiry is very heavy. On current orders prices range from \$7.50 to \$8, per base box at mill. We quote long-terne plate 28 gage, base, \$7 to \$7.50; short-terne plate, \$11.50 to \$12.50, at makers' mill. The Bethlehem Steel Company is reported to be soliciting business in tin plate for delivery late this year, expecting to have its new tin-plate mills at South Baltimore, Md., in partial operation about July 1, or shortly after.

Shafting.—Some large consumers have covered their needs of shafting over second half of this year at 20 per cent off list, while other smaller consumers have contracted for third quarter and some cases last half of year delivery at 15 per cent off list. Makers are not covering the jobbers for delivery beyond July 1. Specifications from the automobile trade and the screw stock machine people are heavy, but from the implement trade are rather light. We quote cold-rolled shafting at 20 to 15 per cent off in carload lots and 10 per cent off in less than carload lots for first quarter and first half, f.o.b. Pittsburgh, freight added to point of delivery.

Railroad Spikes and Track Bolts.—Local makers of spikes report they are filled up for four or five months ahead, and several are refusing to quote on new inquiries for delivery in first half of 1918. The inquiry from the Canadian Government for 6000 kegs has not yet been placed. Reports are that the New York Central has about closed with three or four makers for upward of 25,000 kegs of spikes for delivery in last half of this year. We quote track bolts with square nuts at 4.85c. to 5c. to railroads and 5c. to 5.25c. in small lots to jobbers, base. Railroad spikes, 9/16 in. and larger, \$3.40, base; 7/16 and $\frac{1}{2}$ in., \$3.50, base; 5/16 and $\frac{3}{8}$ in., \$3.75, base. Boat spikes, \$3.65, base, all per 100 lb. f.o.b. Pittsburgh.

Wire Products.—It is likely that before this week is out, an advance of at least \$3 a ton, and possibly \$5, will be made on wire products. One leading maker has withdrawn all prices preparatory to an announcement. The mills are filled up for three or four months on contracts for wire and wire nails, and are considerably back in deliveries, due to cutting down on their output on account of shortage in fuel and also because of lack of cars. There is no trouble in getting 10c. and up to 25c. premiums over the regular price of wire nails, where a mill can make fairly prompt shipments. It is said that fully 100,000 tons or more of barb wire for export shipment have lately been placed, deliveries running to July 1, or later. Most of this material is for France and Italy. Prices in effect at this writing are as follows: Wire nails, \$3, base, per keg; galvanized, 1 in. and longer, including large head barbed

roofing nails, taking an advance over this price of \$2, and shorter than 1 in., \$2.50. Bright basic wire is \$3.05 per 100 lb.; annealed fence wire, Nos. 6 to 9, \$2.95; galvanized wire, \$3.65; galvanized barb wire and fence staples, \$3.85; painted barb wire, \$3.15; polished fence staples, \$3.15; cement-coated nails, \$2.90, base, these prices being subject to the usual advances for the smaller trade, all f.o.b. Pittsburgh, freight added to the point of delivery, terms 60 days net, less 2 per cent off for cash in 10 days. Discounts on woven wire fencing are 53 per cent off list for carload lots, 52 per cent for 1000-rod lots, and 51 per cent for small lots, f.o.b. Pittsburgh.

Wire Rods.—New demand is insistently heavy and much beyond the capacity of the mills to furnish promptly. Canada has inquiries in this market at present for large quantities. While part of this business may be taken by local mills at \$80 or higher, most of it will be turned away, as the mills cannot spare the rods. A heavy demand for high-carbon rods is expected, in view of the preparedness work of the Government, and sales have been made at \$90 to \$110 at mill. We quote soft Bessemer, open-hearth and chain rods at \$75 to \$80, but the \$75 price has about disappeared. We quote high-carbon rods, made from acid steel, at \$90 to \$110 per net ton at mill, prices depending entirely on the carbons and the deliveries wanted.

Iron and Steel Bars.—New demand is fairly heavy, but most consumers are covered up to July 1, and some over the entire year. Specifications against contracts are fairly active. The output of the Carnegie and the Jones & Laughlin Steel companies on steel bars is practically under contract for all of this year. Other makers that can ship out steel bars in 60 to 90 days are able to get 3.25c. at mill, and we note one sale of 500 tons at this price for May and June shipment. A Youngstown, Ohio, mill recently took a contract for 2500 tons of steel rounds for third quarter, and 3500 tons per month for last half of this year at about 4.75c. at mill for export shipment, to be used in making war munitions. We quote steel bars at 3c. at mill for extended delivery, and from 3.10c. to 3.25c. for shipment in three to four months. We quote refined iron bars at 3.25c. and railroad test bars at 3.40c. in carload lots at mill.

Nuts and Bolts.—In the past week new demand has been heavier than for some time and shipments have been better, more cars being furnished. Stocks in warehouses have been materially reduced. It is said that a few very large consumers of nuts and bolts have been covered over second half of this year, but most makers are refusing to sell for delivery beyond July. Not much attention is being paid to export inquiry, as makers need their entire output for domestic trade. Discounts in effect, and which are stated to be firmly held, are as follows, delivered in lots of 300 lb. or more, when the actual freight rate does not exceed 20c. per 100 lb., terms 30 days net, or 1 per cent for cash in 10 days:

Carriage bolts, small, rolled thread, 40 and 10 per cent; small, cut thread, 40 and 2½ per cent; large, 30 and 5 per cent.

Machine bolts, h. p. nuts, small, rolled thread, 50 per cent; small, cut thread, 40 and 10 per cent; large, 35 and 5 per cent.

Machine bolts, c. p. c. and t. nuts, small, 40 per cent; large, 30 per cent. Bolt ends, h. p. nuts, 35 and 5 per cent; with c. p. nuts, 30 per cent. Lag screws (cone or gimlet point), 50 per cent.

Nuts h. p. sq. and hex., blank, \$2.50 off list, and tapped, \$2.20 off; nuts, c. p. c. and t. sq., blank, \$2.10 off, and tapped, \$1.90 off; hex., blank, \$2.25 off and tapped \$2 off. Semi-finished hex. nuts, 50, 10 and 5 per cent. Finished and case-hardened nuts, 50, 10 and 5 per cent.

Rivets 7/16 in. in diameter and smaller, 40 and 10 per cent.

Rivets.—Most consumers are covered to July, and some through the third quarter of this year. Export demand is active and there is no trouble in making export sales of rivets where permits can be secured from the railroads to load the cars. Local consumers are getting better deliveries than for some time, due to the fact that embargoes are on at a number of plants to

which shipments of rivets cannot be made, and they are being turned over to local users. Prices are firm, on less than carload lots 10c. to 15c., or more, per 100 lb., being readily paid by consumers for reasonably prompt shipment. Makers quote buttonhead structural rivets, ½ in. in diameter and larger, \$4.25 per 100 lb., base, and conehead boiler rivets, same sizes, \$4.35 per 100 lb., base, f.o.b. Pittsburgh. Terms are 30 days net, or one-half of 1 per cent for cash in 10 days.

Hoops and Bands.—Specifications against contracts are coming in freely, and the Carnegie Steel Company is reported sold up on both hoops and bands over all of this year. Most consumers are covered to July 1, and some over the entire year and new demand is only fair. The Carnegie Steel Company continues to quote steel bands at 3c., extras as per the steel-bar card, and has made sales of hoops at 3.75c. at mill for indefinite delivery. We quote steel bands for fairly prompt delivery at 3.25c. to 3.50c., and steel hoops from 3.75c. to 4c. at mill.

Cold-Rolled Strip Steel.—Most of the large consuming trade is covered to July 1, but so far none of the makers has sold for delivery beyond that date. On current orders prices range from \$7.50 to \$8 per 100 lb., depending on the quantities and deliveries wanted. We quote cold-rolled strip steel for second quarter delivery at \$7 per 100 lb. Terms are 30 days net, less 2 per cent off for cash in 10 days, delivered in quantities of 300 lb. or more when specified for at one time.

Wrought Pipe.—On lap weld and line pipe, several of the larger mills are practically sold up to October, and one leading interest, with obligations already on its books and reservations for regular customers, is about sold up for the entire year. Inquiries for line pipe for gas and oil lines, mostly from Oklahoma and Texas fields, are fairly heavy, but none of the mills is in position to take on new contracts for line pipe for delivery before late in the year. The Gulf Refining Company, this city, has sent out inquiries for 35,000 ft. of 8-in. steel pipe, 25 lb. to the foot, 60,000 ft. of 10-in., 32 lb., 250,000 ft. of 6-in. drill pipe and 12,000 ft. of 4½-in. special rotary pipe, all to be made of steel, and all for delivery in last half of this year. On butt weld sizes of iron and steel pipe, mills can make deliveries in six to eight weeks from date of order. Discounts on iron and steel pipe are given on another page.

Boiler Tubes.—Printed discounts are purely nominal, as most makers of iron and steel tubes have their entire output sold up over all of this year. Heavy premiums over regular prices are readily paid for fairly prompt shipment. Discounts on iron and steel boiler tubes are given on another page.

Coke.—The car supply was better last week, and more coke was moved from the ovens than in any week for some time. However, there are still hundreds of cars loaded for shipment to Pittsburgh and the valleys which may not be delivered for some days. Operations at ovens last week were on a better scale, and if the mild weather should last for another week or two it is believed that conditions would then be about normal. Sales of high-grade furnace coke have been made for prompt shipment at \$11.50 to \$12, and 72-hr. foundry at \$13 to \$14 per net ton at oven. The demand for furnace coke for spot shipment has quieted down. A number of the blast furnaces in the Pittsburgh and nearby districts that were banked for lack of coke have been started. We quote best grades of furnace coke at \$12 to \$12.50 per net ton at oven for spot shipment, but there is nothing doing in contracts, consumers refusing to pay the high prices of \$7 and \$8 per ton asked by producers. We quote best grades of 72-hr. foundry coke for spot shipment at \$13 to \$14 per net ton at oven, and on contracts \$7 to \$8. Contracts for 15,000 to 20,000 tons of foundry coke are reported to have been closed last week for shipment in the second quarter and last half of this year at about \$7 per net ton at oven. New inquiry for foundry coke from Canada is quite active, and some large orders were placed last week. The Connellsville *Courier* gives the output of coke in the upper and lower Connellsville regions for

the week ended Feb. 17 as 306,624 net tons, an increase over the previous week of 3691 tons.

Old Material.—The local scrap market continues generally inactive, with prices steady. Consumers have large stocks, which they say they desire to use up before buying more. One leading consumer claims to have 200 cars of scrap on track, and is refusing to buy more at any price. Better prices can be secured in the Sharon and Youngstown districts than in the local market. An embargo is reported on scrap routed to the Central Steel Company, Massillon, Ohio. Railroads are refusing to accept cars loaded with scrap for shipment to a foreign road, stating they must keep their cars on their own lines. The Pennsylvania Railroad will not accept cars for shipment west and the Pennsylvania Lines West will not accept cars for shipment east of Pittsburgh. There has been quite heavy buying of borings and turnings, one consumer having taken 2500 to 3000 tons of turnings at \$11.50 to \$11.75 and 3000 to 4000 tons of borings at \$11.75 to \$12. We note a sale of 600 tons of heavy steel scrap at \$20.50, delivered, and 2000 tons at \$22, delivered, to a Sharon consumer. We also note sales of 1000 to 1200 tons of old carwheels at \$20 to \$20.50, delivered. Prices for delivery in Pittsburgh and at other consuming points that take Pittsburgh freight rates, per gross ton, are nominally as follows:

Heavy steel melting scrap, Steubenville, Follansbee, Brackenridge, Sharon, Monessen, Midland and Pittsburgh, delivered	\$21.00 to \$22.00
No. 1 foundry cast	20.00 to 20.50
Rerolling rails, Newark and Cambridge, Ohio; Cumberland, Md., and Franklin, Pa.	27.00 to 28.00
Hydraulic compressed sheet scrap	18.00 to 18.50
Bundled sheet scrap, sides and ends, f.o.b. consumers' mills, Pittsburgh district	15.50 to 16.00
Bundled sheet stamping scrap	15.00 to 15.50
No. 1 railroad malleable stock	19.00 to 19.50
Railroad grate bars	12.50 to 13.00
Low phosphorus melting stock	32.00 to 32.50
Iron car axles	41.00 to 42.00
Steel car axles	45.00 to 46.00
Locomotive axles, steel	48.00 to 49.00
No. 1 busheling scrap	18.50 to 19.00
Machine-shop turnings	11.50 to 11.75
Old carwheels	20.50 to 21.00
Cast-iron borings	11.75 to 12.00
*Sheet bar crop ends	25.00 to 26.00
No. 1 railroad wrought scrap	24.50 to 25.00
Heavy steel axle turnings	15.50 to 16.00
Heavy breakable cast scrap	19.00 to 19.50

*Shipping point.

Effective Feb. 21, Charles C. Ross retired from the firm of George A. McLean & Co., Pittsburgh, and has opened an office in room 518 Farmers Bank Building, Pittsburgh, under his own name, and will continue to handle iron and steel scrap of all kinds.

Chicago

CHICAGO, ILL., Feb. 27, 1917.

Pig-iron prices are again higher and investigation of the situation at the furnaces, particularly in the South, shows the amount of iron still available for sale this year to be very small. For spot iron extremely high prices have been made in a number of instances. A slight betterment in the railroad situation is reported and some of the embargoes have been lifted. Railroad officials are speaking more hopefully of the prospect of clearing up the congestion as milder weather begins to prevail. The re-opening of certain territories which have been cut off from deliveries by railroad embargoes is expected to have a noticeable effect upon other markets which have been profiting by the diverting of shipments. In the matter of finished steel products there is little opportunity for unusual market happenings, most of the producers finding themselves in situations which admit of little or no choice as regards sales. Plates, shapes and bars can be had for delivery in three to four months from some of the steel mills selling into this territory, at minimum prices of 5c., at mill, for tank plates; 3.50c. to 3.75c. for structural steel and 3.50c. for bars. Even higher prices are being obtained for shorter deliveries, but the total of new business going on the books for early delivery is relatively small. Contracting for steel bars by the manufacturing

trade and some of the implement interests, specifications to be sent in in the last half with the expectation of first-half delivery, has attained to some volume. The reports of railroad buying for 1919 are largely founded upon the arrangements made by one railroad in the South with the Alabama mill, providing for rails for delivery in the winter of 1918-19.

Pig Iron.—Prices of both Northern and Southern pig iron are advancing steadily and the strength of the market appears to have very substantial foundation in the well-sold-up condition of the furnaces. For forward delivery, Northern iron has been put on the basis of \$34 at the furnace and there is very little to be had, particularly malleable Bessemer. A southern Ohio producer of malleable has named a price of \$40 for the first half of 1918, and is out of the market for the remainder of this year. A parallel situation is noted with regard to the Virginia furnaces. Reports from the South indicate that the larger producers of standard Southern iron have only a small tonnage available for sale this year, although some sales are being made. One interest is understood to have disposed of about 6000 tons in this market last week, and the price is more generally on the basis of \$26, Birmingham. However, sales at prices between \$25 and \$26 have not entirely disappeared. The demand for spot iron continues such as to command a premium for that delivery and a sale of Southern iron approximating 1.80 per cent silicon has been made on the basis of \$32, Birmingham. Southern silveries have firmed up and are now quotable at approximately the same basis as Ohio silvery. Sales last week were not so heavy as in the week preceding and the individual transactions involved smaller quantities. A maker of conveying machinery is now in the market for 1000 tons of charcoal or malleable Bessemer iron for its Indianapolis plant and is expected to be in the market within a few days for a considerably larger quantity for last-half delivery. For Lake Superior charcoal iron we quote delivery prices at Chicago to include a freight rate of \$1.75. The following quotations are for iron delivered at consumers' yards, except those for Northern foundry, malleable Bessemer and basic irons, which are f.o.b. furnace, and do not include a switching charge averaging 50c. per ton:

Lake Superior charcoal, Nos. 2 to 5	\$35.75 to \$37.75
Lake Superior charcoal, No. 1	36.75 to 38.75
Lake Superior charcoal, No. 6 and Scotch	36.75 to 39.75
Northern coke foundry, No. 1	33.50
Northern coke foundry, No. 2	33.00
Northern coke foundry, No. 3	32.50
Northern high phosphorus foundry	30.00
Southern coke No. 1 f'dry and 1 soft	29.50 to 30.50
Southern coke No. 2 f'dry and 2 soft	29.00 to 30.00
Malleable Bessemer	33.00
Basic	33.00
Low phosphorus	58.00 to 59.00
Silvery, 8 per cent.	43.50 to 44.50
Bessemer ferrosilicon, 10 per cent.	50.00

Rails and Track Supplies.—The week brought out no activity of moment in track material. The reports of contracting for rails for 1918 delivery seem to go back to the arrangement of the Southern Railway for its requirements in the winter of 1918-19. Quotations are as follows: Standard railroad spikes, 3.50c. to 3.60c., base; track bolts with square nuts, 4.50c. to 4.60c., base, all in carloads, Chicago; tie-plates, \$55 to \$60, f.o.b. mill, net ton; standard section Bessemer rails, Chicago, \$38, base; open-hearth, \$40; light rails, 25 to 45 lb., \$44; 16 to 20 lb., \$45; 12 lb., \$46; 8 lb., \$47; angle bars, 2.25c.

Structural Material.—The Pennsylvania Railroad has placed orders for about 3700 tons of bridge steel for track elevation at Chicago with the American Bridge Company, the McClintic-Marshall Company and the Fort Pitt Bridge Works. Other structural awards include 1000 tons of plate girders, taken by the McClintic-Marshall Company for the St. Louis & San Francisco Railroad; 700 tons by the Lacy Mfg. Company for a water tank for the city of Los Angeles; 300 tons by the Warden-Allen Company for a Lake Superior copper mill and 150 tons by the Gage Structural Steel Works for an office building in Chicago. A slight increase in car inquiry and buying is noted, the Great Northern being in the market for 300 steel gondolas and 20 steel mail

cars. The Consolidated Coal Company has bought 300 hopper cars from the Pullman Company and the Louisville & Nashville 1000 steel underframes from the Bettendorf Company, which company will also furnish 230 flat cars for the Chicago, Milwaukee & St. Paul. Miscellaneous car orders total approximately 500, with the prospect of the Southern Pacific building some 1350 cars in its own shops. We quote for Chicago delivery of structural steel from mill 3.43c. to 3.68c.

We quote for Chicago delivery of structural steel out of jobbers' stocks, 4c.

Plates.—There is inquiry in the market for a tonnage of still-bottom-quality open-hearth plates on which quotations of 6c. and higher are being made. For ordinary tank plates for delivery in the third quarter, a minimum of 5c., at the mill, represents the general market level. For ship plates and extra widths prices very generally approximate 6c. and extras. We quote for Chicago delivery of plates from mill, at its convenience, 3.93c.; for prompt shipment, in widths up to 72 in., 5.18c., and for wide plates, 5.68c. to 6.19c., depending upon deliveries.

We quote for Chicago delivery of plates out of jobbers' stocks, 4.75c.

Sheets.—Because of the very limited number of sources of supply, the restricted amount of sheets possible of securing and the ability of the mills to ask almost what they wish, each week becomes very much a repetition of the preceding and the market presents a uniform appearance of materials scarcity and firm prices. We quote, for Chicago delivery, No. 10 blue annealed, 4.50c. to 4.75c.; box annealed, No. 16 and lighter, 5c. to 5.25c.; No. 28 galvanized, 6.50c. to 6.75c. These quotations are minimum prices for contracts. Early shipment quotations are \$5 to \$10 per ton higher.

We quote for Chicago delivery out of stock, regardless of quantity, as follows: No. 10 blue annealed, 5.25c.; No. 28 black, 5.40c.; No. 28 galvanized, 7.50c.

Bars.—The contracting by the manufacturing trade and some of the lesser of the implement manufacturers for mild steel bars, delivery of which is expected to be made in the first half, has grown in volume to the point of importance. There is likewise a contracting movement under way in respect of iron bars and as far ahead as the mills are willing to take business they are reported well sold up. We quote mill shipment, Chicago, as follows: Bar iron, 3c. to 3.25c.; soft steel bars, 3.18c. to 3.43c.; hard steel bars, 3c. to 3.25c.; shafting, in carloads, 20 per cent off; less than carloads, 15 per cent off.

We now quote store prices for Chicago delivery as follows: Soft steel bars, 3.75c.; bar iron, 3.75c.; reinforcing bars, 3.75c., base, with 5c. extra for twisting in sizes $\frac{1}{2}$ in. and over and usual card extras for smaller sizes; shafting list plus 5 per cent.

Rivets and Bolts.—Buyers of both rivets and bolts appear to be well covered by contracts and there is very little activity in the market in the way of new orders, though specifications are showing no evidence of diminishing consumption. We quote as follows: Carriage bolts up to $\frac{1}{2}$ x 6 in., rolled thread, 40-10; cut thread, 40-2 $\frac{1}{2}$; larger sizes, 30-5; machine bolts up to $\frac{1}{2}$ x 4 in., rolled thread, with hot pressed square nuts, 50; cut thread, 40-10; large size, 35-5; gimlet-point coach screws, 50; hot pressed nuts, square, \$2.50 off per 100 lb.; hexagon, \$2.60 off. Structural rivets, $\frac{1}{4}$ to 1 $\frac{1}{4}$ in., 4.40c. to 4.45c., base, Chicago, in carload lots; boiler rivets, 10c. additional.

Store prices are as follows: Structural rivets, 4.50c.; boiler rivets, 4.60c.; machine bolts up to $\frac{1}{2}$ x 4 in., 40-10; larger sizes, 35-5; carriage bolts up to $\frac{1}{2}$ x 6 in., 40-2 $\frac{1}{2}$; larger sizes, 30-5; hot pressed nuts, square, \$3, and hexagon, \$3 off per 100 lb.; lag screws, 50.

Cast-Iron Pipe.—The American Cast Iron Pipe Company has been awarded 350 tons at Rockford, Ill., and at Springfield, Ill., bids will be received under a re-advertised letting on 1450 tons. At Dundee, Mich., 450 tons is to be bought; at Chilton, Wis., 400 tons, and at Castlewood, S. D., 200 tons. Bids are to be opened at Winnipeg, Can., March 16 on a quantity of pipe expected to reach 5000 tons of 48 to 60 in. Prices of pipe have been advanced \$1 per ton and we quote as follows, per net ton, Chicago: Water pipe, 4-in., \$45.50; 6-in. and

larger, \$42.50, with \$1 extra for class A water pipe and gas pipe.

Old Material.—While bullishly inclined dealers are exerting their influence to make the occasional purchase of scrap for prompt delivery, at a premium price, support the movement toward a generally higher market level, but little progress is being made in that direction. Prices this week are essentially the same as those of a week ago. Consumer buying has been only moderately heavy and much of it is being occasioned by delays in the delivery of scrap on outstanding orders. Railroad offerings of scrap are still below normal, lists from the New York Central Lines and the Burlington being the only ones of importance. We quote for delivery at buyers' works, Chicago and vicinity, all freight and transfer charges paid, as follows:

	Per Gross Ton
Old iron rails	\$27.00 to \$28.00
Relaying rails	34.00 to 35.00
Old carwheels	18.00 to 18.50
Old steel rails, rerolling	27.00 to 28.00
Old steel rails, less than 3 ft	24.50 to 25.00
Heavy melting steel scrap	22.25 to 22.75
Frogs, switches and guards, cut apart	22.25 to 22.75
Shoveling steel	19.00 to 19.50
Steel axle turnings	14.00 to 14.50

	Per Net Ton
Iron angles and splice bars	\$27.00 to \$27.50
Iron arch bars and transoms	27.75 to 28.25
Steel angle bars	21.50 to 22.00
Iron car axles	34.00 to 35.00
Steel car axles	34.00 to 35.00
No. 1 railroad wrought	24.00 to 25.00
No. 2 railroad wrought	23.00 to 24.00
Cut forge	23.00 to 24.00
Pipes and flues	14.00 to 14.50
No. 1 busheling	16.50 to 17.00
No. 2 busheling	12.50 to 13.00
Steel knuckles and couplers	22.50 to 23.00
Steel springs	23.50 to 24.00
No. 1 boilers, cut to sheets and rings	13.50 to 14.00
Boiler punchings	18.50 to 19.00
Locomotive tires, smooth	31.00 to 31.50
Machine-shop turnings	9.25 to 9.75
Cast borings	9.25 to 9.75
No. 1 cast scrap	16.00 to 16.50
Stove plate and light cast scrap	12.00 to 12.50
Grate bars	12.50 to 13.00
Brake shoes	12.50 to 13.00
Railroad malleable	17.25 to 17.75
Agricultural malleable	14.75 to 15.25

Wire Products.—Renewed inquiry for wire in various forms from the European countries has again spread itself into all of the markets. The domestic situation is unchanged and prices are as last quoted. We quote to jobbers as follows, per 100 lb.: Plain wire, Nos. 6 to 9, base, \$3.239; wire nails, \$3.189; painted barb wire, \$3.339; galvanized barb wire, \$4.039; polished staples, \$3.339; galvanized staples, \$4.039, all Chicago.

Philadelphia

PHILADELPHIA, PA., Feb. 27, 1917.

The purchasing department of the Pennsylvania Railroad has been authorized to cover one-third of its 1918 rail requirements. The situation in finished steel products shows little change, with the builders of locomotives and cars and the shipyards pressing hard for material. It is predicted that ordinary tank plates will soon go to 5.50c., Pittsburgh. One producer is asking 4c., Pittsburgh, for shapes. The makers of iron bars have advanced their quotation to 3.25c., Pittsburgh base. Billets are scarcer than ever, with a consequent greater demand for discard shell steel, the makers of which ask \$40 to \$70 per ton. There is much conjecture as to how the consumers of steel will fare in the last half of the year. Many of them, especially those using plates, are eager to enter contracts, but the mills are holding back, and only entering contracts with regular customers, and then only to cover absolute requirements. The pig-iron market is more active and stronger, and iron is scarce, all indicating that a spot market is developing. Some of the producers are quoting what they consider prohibitory prices to keep business away. One maker of basic is holding his product for \$40 per ton. Standard low phosphorus is not easy to get at \$60. Old material is on the move, heavy melting steel in particular being in demand both for domestic and export delivery. Although the railroad situation is easier the spot coke market is a little higher.

Pig Iron.—The market is active and stronger, with consumers finding it increasingly difficult to obtain iron.

Not only has a good business been done in small and moderate-sized lots, but some large inquiries are out. A radiator manufacturer is inquiring for 3000 tons for last-half delivery at Johnstown, and a similar quantity for Trenton. The Pennsylvania Railroad wants 500 tons of charcoal iron for March and April. The Baldwin Locomotive Works is inquiring for 3000 to 5000 tons of cylinder iron for Eddystone, delivery at the rate of 250 tons weekly beginning April 1, and a Bristol cast-iron pipe works is in the market for 5000 tons of iron. A large part of the activity of the week has been in Alabama iron for last-half delivery at prices ranging from \$24 to \$25, furnace, the latter figure now being generally held. Makers of eastern Pennsylvania No. 2 X who a week ago were asking \$32, furnace, now ask \$33, and do not want too much business at the higher price, the minimum delivered price being about \$33.50. The attitude of sellers is indicated by the fact that an order from a broker for 700 tons of No. 2 X at \$33, furnace, was declined. The producers are much concerned over their costs in the next few months, one interest declaring that by the middle of the year it is highly probable that it will cost \$30 to make a ton of iron. In the case of one brand of No. 2 X, which is still held at \$32, furnace, the delivered price is \$33.68, while another, made nearer this city, is quoted at \$33, furnace, and its delivered price is \$33.55. A lot of No. 2 plain was taken at the equivalent of \$33.79, Philadelphia. It is stated that sales of No. 2 X have been made in exceptional cases at \$34, furnace, while some makers hold for \$35 and \$36, furnace, but these prices are understood to have been fixed with a view of keeping business away. Some prompt Virginia No. 2 X is quoted at \$32, furnace, or \$34.75, delivered, while another Virginia brand is held at \$34, furnace, and another at \$35. One Virginia producer is taking care of a few of his regular customers for last-half delivery at \$30, furnace, or \$32.75, Philadelphia. A local consumer of basic took a few hundred tons, some of it, at least, being resale iron. Such is the faith of one maker of basic that he is holding his product for \$40, furnace. Not much has been done in standard low phosphorus for the reason that little is available for first-half delivery, and at present prices there is less willingness to buy for the second half. The railroad situation is easier, and furnaces which have been threatened with banking now have a more favorable prospect. Some have been getting only 40 to 50 per cent of the required fuel and have been banked intermittently. Quotations for standard brands delivered in buyers' yards, prompt shipment, range about as follows:

Eastern Pa. No. 2 X foundry.....	\$33.00 to \$33.50
Eastern Pa. No. 2 plain.....	32.50 to 33.00
Virginia No. 2 X foundry.....	32.75 to 33.25
Virginia No. 2 plain.....	32.25 to 32.75
Gray forge.....	29.75 to 30.75
Basic.....	30.50 to 31.50
Standard low phosphorus.....	60.00

Iron Ore.—Arrivals of iron ore at this port in the week ended Feb. 24 consisted of 9450 tons from Sweden, 4000 tons from French Africa, and 12,658 tons from Spain.

Ferroalloys.—The situation shows little change. The foreign makers have taken some business at \$185, seaboard, forward delivery, but are not booking all the orders offered. Domestic makers continue to quote \$275 to \$300, delivered, for third quarter, and \$250 to \$275 for the last quarter. A small lot of spot was taken at \$300. Spiegeleisen is active, and quoted from \$75 to \$80, furnace. Fifty per cent ferrosilicon is not being offered. For 11 per cent material \$48.50, furnace, equal to \$51.99, is quoted. The arrival of 779 tons of English ferromanganese at this port last week is reported.

Plates.—Probably 200,000 tons of ship material is before the trade, but it is difficult to determine to what extent individual inquiries are duplicated. One inquiry made yesterday by a broker called for 15,000 to 50,000 tons, while a 40,000-ton inquiry is pending. One producer closed for 7000 to 8000 tons in the week. Both ship and boiler plates are especially active for export. The quotation for ship plates is 6c., Pittsburgh, but in one instance 6.50c., Eastern mill, was quoted for shipment in early 1918. A mill declined a large tonnage at this price. Domestic buyers are eager to make contracts, but the mills are following a conservative policy,

and only entering arrangements to cover the actual requirements of regular customers. It is regarded as probable that tank steel will soon advance to 5.65c., Philadelphia. At present tank plates are held at 5.15c., Philadelphia. Small mills are asking 6.50c. for ten-day shipments of ordinary tank steel, and 5c. for shipment in 6 to 8 weeks.

Structural Material.—A large maker quotes 4.15c., Philadelphia, for both ship and domestic shapes, but another maker's minimum is 3.65c., Philadelphia. A warehouse for Strawbridge & Clothier, this city, is to be of reinforced concrete, but will require a goodly tonnage of bars and column cores. It is reported that Lewis F. Shoemaker & Co. have booked the contract for 2000 tons of steel required for the Worth Steel Company's new rolling mill at Claymont, Del. The Philadelphia subway awards have not been made.

Billets.—The market grows tighter, some makers being out entirely. The only quotation obtainable for forging billets is \$85, mill, at which sales have been made. Open-hearth rereeling steel is nominally held at \$65. Discard shell steel is actively sought, the quotation for rereeling material being about \$40, and for forging stock \$70.

Bars.—The quotation for steel bars is nominally 3.25c., Pittsburgh, or 3.40c., Philadelphia, and no noteworthy developments are reported. The demand for concrete reinforcing bars is good because of the extent to which concrete construction is supplanting structural steel. Iron bars have been advanced, the makers now asking 3.40c., Philadelphia, carload lots.

Sheets.—Makers are well sold up to July, and the market is strong at 4.90c., Philadelphia, for No. 10 blue annealed.

Rails.—The Pennsylvania Railroad has decided to place orders covering one-third of its 1918 requirements, and it has notified some of the steel companies that they will be expected to furnish their quota of 130-lb. rails in the proportion named.

Old Material.—New York interests are offering to take large quantities of heavy melting steel at prices which consumers have heretofore refused to consider, and as a result holders of material are not offering. The situation has greatly strengthened the market, and when the mills act they will be confronted by prices much higher than those recently quoted. Other items are higher also, but No. 1 cast lags when the high price of pig iron is considered. Quotations for delivery in buyers' yards in this district, covering eastern Pennsylvania and taking freight rates from 35c. to \$1.35 per gross ton, are as follows:

No. 1 heavy melting steel.....	\$22.00 to \$23.00
Old steel rails, rereeling.....	30.00 to 31.00
Low phosph. heavy melting steel scrap.....	31.00 to 33.00
Old iron and steel axles (for export).....	43.00 to 45.00
Old iron rails.....	28.00 to 29.00
Old carwheels.....	20.50 to 21.00
No. 1 railroad wrought.....	27.00 to 28.00
Wrought-iron pipe.....	18.00 to 18.50
No. 1 forge fire.....	15.00 to 15.50
Bundled sheets.....	14.50 to 15.00
No. 2 busheling.....	13.00 to 14.00
Machine-shop turnings.....	13.00 to 13.50
Cast borings.....	14.00 to 14.50
No. 1 cast.....	20.00 to 21.00
Grate bars, railroad.....	15.50 to 16.00
Stove plate.....	16.00 to 16.50
Railroad malleable.....	17.50 to 18.00

Coke.—Many contracts covering the last half of the year have been placed for foundry coke at \$7.20 per net ton at oven, but some makers ask up to \$7.50. Spot foundry ranges from \$14 to \$15. Contract furnace is entirely nominal at \$6 to \$8.50 at oven, but spot ranges all the way from \$12 to \$15. The raising of embargoes here and there promises relief to some consumers, but the general situation is still bad, not only because of shipping conditions, but because of an actual scarcity of coke. Freight rates from the principal producing districts are as follows: Connellsville, \$2.05, Latrobe, \$1.85, and Mountain, \$1.65.

The Noble Electric Steel Company, Heroult, Cal., is reported to have taken up the manufacture of the electrodes needed for its two new electric furnaces because of its inability to obtain electrodes in the market.

Cincinnati

CINCINNATI, OHIO, Feb. 28, 1917.—(By Wire.)

Pig Iron.—Prices continue to advance, especially on iron for prompt shipment. Although some Southern No. 2 foundry iron was disposed of as late as Saturday at \$24.50, Birmingham, for first half shipment, the furnaces selling this iron have marked up their quotations. A little resale iron can yet be bought at \$25, but \$26 is now said to be the minimum furnace price. Several furnaces are asking as high as \$28 and a few sales have been made at this figure. Last half quotations range from \$25 to \$28. Some iron for last quarter shipment has been bought by two nearby consumers for use, it is understood, in the first part of 1918. It is also reported that a few contracts have been made for strictly first quarter shipment next year. Several Southern furnaces have withdrawn from the market for the first half of this year, and are not anxious for any last half business. In the Hanging Rock district there is such a shortage of iron for prompt movement that no orders can be taken except for small lots of off-grade foundry iron, and these are almost cleaned up. The furnaces in that district have established a minimum of \$33, Ironton, for the last half on foundry, basic and malleable. There are no quotations on Ohio silvery iron for nearby shipment. Inquiry for all grades of both Southern and Northern iron is nominally light, although a number of Ohio and Indiana melters are feeling the market out for the last half of this year and the first quarter of next. Based on freight rates of \$2.90 from Birmingham and \$1.26 from Ironton, we quote, f.o.b. Cincinnati, as follows:

Southern coke, No. 1 f'dry and 1 soft.	\$29.40 to \$29.90
Southern coke, No. 2 f'dry and 2 soft.	28.90 to 29.40
Southern coke, No. 3 foundry.	28.40 to 28.90
Southern coke, No. 4 foundry.	27.90 to 28.40
Southern gray forge.	25.90 to 26.40
Ohio silvery, 8 per cent silicon.	39.26 to 41.26
Southern Ohio coke, No. 1.	34.76
Southern Ohio coke, No. 2.	34.26
Southern Ohio coke, No. 3.	33.76
Southern Ohio malleable Bessemer.	34.26
Basic, Northern.	34.26
Lake Superior charcoal.	33.20
Standard Southern carwheel.	31.90

(By Mail)

Finished Material.—Mill specifications for carload lots of structural shapes, bars and other material are coming in at a rapid rate, the advanced prices being considered no hindrance when deliveries could be made. Especially is this true for reinforcing concrete bars. The railroad car situation, coupled with the congestion of mill order books, is transferring the burden of filling promptly less than carload orders to the shoulders of the jobbers in a large measure. As a rule, local warehouse stocks may not be considered near normal. The hampering of mill shipments to replenish these stocks is becoming more acute, but so far there has been no difficulty in filling rush orders from local and nearby customers. We quote to-day's store prices as follows: Structural shapes, 4.10c.; plates, $\frac{1}{4}$ in. and heavier, 5c.; No. 10 blue annealed sheets, 5.25c.; steel bars, 3.90c.; rounds and squares, 2 in. and over, 4.45c., base; flat bars, over 1 in. thick, 4.45c., base; twisted steel bars, 4.95c.; wire nails, \$3.40 per keg, base; barb wire, \$4.20 per 100 lb. The nearby mills are quoting No. 28 black sheets around 5.15c. Newport, Cincinnati, and No. 28 galvanized at 7.15c. It is reported that an advance in high-speed drills will take place March 1.

Coke.—Consumers of both furnace and foundry coke do not hesitate to pay high premiums where the seller can make a reasonable guarantee of delivery. Furnace coke for prompt shipment has sold in the Connellsville district around \$11.50 to \$12, but contract figures range from \$7 to \$8 per net ton at oven. Foundry coke has been bought as high as \$15, but future shipment orders would be taken at \$8 to \$9 per net ton at oven. The same conditions exist in both the Wise County and Pocahontas fields. Through the strenuous efforts of both producers and selling agents, deliveries of foundry coke on old contracts have lately been made at a better rate than during the first half of February.

Old Material.—A better demand for heavy melting scrap characterizes the market this week. There is also

a call for different kinds of wrought iron and steel. Shipments to eastern consuming points are slow, and the railroads refuse to accept shipments to quite a number of consuming centers. Prices have advanced, although borings and turnings are lagging. The local foundry demand continues very good. The following are dealers' prices, f.o.b. at yards, southern Ohio or Cincinnati:

	Per Gross Ton
Bundled sheet scrap.	\$15.00 to \$15.50
Old iron rails.	24.75 to 25.25
Relaying rails, 50 lb. and up.	28.25 to 28.75
Rerolling steel rails.	24.75 to 25.25
Heavy melting steel scrap.	21.25 to 21.75
Steel rails for melting.	21.25 to 21.75

	Per Net Ton
No. 1 railroad wrought.	\$22.00 to \$22.50
Cast borings.	6.50 to 7.00
Steel turnings.	6.50 to 7.00
Railroad cast.	16.25 to 17.25
No. 1 machinery cast.	18.00 to 18.50
Burnt scrap.	10.25 to 10.75
Iron axles.	33.50 to 34.00
Locomotive tires (smooth inside).	28.00 to 28.50
Pipes and flues.	13.75 to 14.25
Malleable cast.	15.25 to 15.75
Railroad tank and sheet.	12.25 to 12.75

Buffalo

BUFFALO, N. Y., Feb. 27, 1917.

Pig Iron.—There has been considerable small lot inquiry during the week from melters whose regular supplies have been interrupted and delayed by freight blockades, also from others who have been using larger tonnages than they had figured on or contracted for. High silicon irons have been sold in small quantities at \$37 and \$37.50, furnace, for prompt delivery, where furnaces have had such metal to dispose of. Off-grade iron has been sold at \$35, furnace. Very little iron of regular foundry grades has been obtainable from Buffalo furnaces; but if it could be secured in fairly good sized tonnages, for quick shipment, it would undoubtedly find a ready market at an average of \$37, at furnace. Even Southern iron is becoming more difficult to obtain. The freight situation is now improving slowly, and shipments from furnaces are going forward a little more freely than for the previous three weeks. We quote as follows for first-quarter and first-half delivery, f.o.b. furnace, Buffalo:

High silicon irons.	\$35.00 to \$37.50
No. 1 foundry.	35.00 to 37.50
No. 2 X foundry.	35.00 to 37.50
No. 2 plain.	35.00 to 37.50
No. 3 foundry.	35.00 to 37.50
Gray forge.	35.00 to 37.50
Malleable.	35.00 to 37.50
Basic.	35.00 to 37.50
Bessemer.	35.00 to 37.50
Charcoal according to brand and analysis.	37.50 to 40.00

Old Material.—The transportation situation is clearing and the handling of material in yards is much improved. Good sized inquiries are coming in for heavy melting steel and also quite a number of large inquiries for old carwheels. Prices of all commodities are holding firmly, but with no marked change in any line. The local market on heavy melting steel is somewhat stronger than for delivery to out-of-town points; offers of \$23.50 from an outside market have been refused. We quote dealers' asking prices, per gross ton, f.o.b. Buffalo, as follows:

Heavy melting steel.	\$24.00 to \$25.00
Low phosphorus.	32.00 to 36.00
No. 1 railroad wrought.	28.00 to 29.00
No. 1 railroad and machinery cast.	22.50 to 23.50
Iron axles.	45.00
Steel axles.	45.00
Carwheels.	23.00 to 23.50
Railroad malleable.	22.00 to 23.00
Machine shop turnings.	10.50 to 11.00
Heavy axle turnings.	16.00 to 16.50
Clean cast borings.	11.00 to 11.50
Iron rails.	25.00 to 26.00
Locomotive grate bars.	15.00 to 15.50
Stove plate.	14.00 to 14.50
Wrought pipe.	16.00 to 16.50
No. 1 busheling scrap.	20.50 to 21.50
No. 2 busheling scrap.	13.00 to 13.50
Bundled sheet scrap.	14.00 to 14.50

Finished Iron and Steel.—Because of the unusual situation in the market, due to the uncertainties of transportation, the retarding of production and to national developments with reference to war measures—affecting both mills and buyers alike—there seems to be a lull in inquiry and in selling. Most producers ap-

pear to be obligated for practically all of their output for 1917 and are averse to taking on contracts at this time that might be carried over into 1918. Inquiries for what would ordinarily be very attractive quantities have been declined through inability of the mills to ship this year. Inquiry for wire products continues heavy and there is also a large demand for ingots and billets, both from domestic and foreign sources. Bids go in to-day on 250 tons of structural steel for the East high school and the Lincoln grade school at Erie, Pa.; also on Feb. 28 for 750 tons for three State barge canal contracts, covering a viaduct at Clyde, N. Y., and bridges at Little Falls and Schuyler'sville, N. Y.

Cleveland

CLEVELAND, OHIO, Feb. 27, 1917.

Iron Ore.—With moderating weather making the handling of ore easier, orders for shipments from docks have improved considerably and shippers are getting a fair supply of cars for handling ore. The market is inactive. We quote prices as follows, delivered lower Lake ports: Old Range Bessemer, \$5.95; Mesaba Bessemer, \$5.70; old range non-Bessemer, \$5.20; Mesaba non-Bessemer, \$5.05.

Pig Iron.—The demand for foundry grades in contracts for both the first and last half is quite active. A Cleveland interest reports the sale of several lots of foundry iron at \$35, Valley furnace, for No. 2, for the last half indicating that the market is well established at that price. For prompt shipment additional sales have been made at \$38. In Toledo \$33 is still the minimum price for the last half, but for spot shipment both foundry and malleable are quoted at \$35. A Cleveland consumer has purchased 1500 tons of malleable iron for March-May delivery at \$35 for shipment from Toledo, the freight rate being \$1.26. An Akron furnace manufacturer is in the market for 1000 tons of foundry iron. Two basic inquiries are pending, each for 5000 tons. Southern producers have come to realize the fact that with prevailing prices for Northern iron they can just as well get higher prices in this territory and have advanced their quotations to a minimum of \$25, Birmingham, for No. 2 for the last half, at which considerable iron has been sold in lots up to 500 tons. Quotations for earlier delivery range from \$26 to \$26.50 and some producers are holding for \$27 for the last half. There is considerable demand for Southern iron running 4 to 5 per cent in silicon, owing to the fact that much of the Northern iron is said to be running low in silicon. The car situation shows no improvement in respect to pig iron shipments, but consumers are further being inconvenienced because of delays in shipments due to the fact that owing to existing conditions furnaces are not keeping up their normal production. We quote, delivered Cleveland, as follows:

Bessemer	\$35.95 to \$36.95
Basic	30.95 to 31.95
Northern No. 2 foundry	34.30 to 35.30
Southern No. 2 foundry	29.00 to 30.00
Gray forge	31.95 to 32.95
Ohio silvery, 8 per cent silicon	41.62 to 43.62
Standard low-phos., Valley furnace	56.00

Coke.—Connellsville foundry coke has sold as high as \$15 per net ton at oven in this market for prompt shipment and is hard to secure at any price. Shipments show no improvement and many foundries are hard pressed for coke. Producers who recently opened their books for foundry coke contracts for the last half and full year at \$7 per net ton at oven have succeeded in booking a fair line of business at that price for those deliveries. However, a number of producers are refusing to quote contract prices.

Finished Iron and Steel.—There is a great deal of inquiry for last-half contracts for steel bars and some for plates and structural material. While mills are trying to avoid commitments, contracts for minimum requirements for steel bars are being made with the larger consumers for the last half at 3c. with no assurance as to deliveries. Some consumers who ordinarily use steel are placing bar-iron contracts for the last half. Considerable inquiry is coming from fabricators for plates and other material to replace

stock for railroad bridge work. With embargoes still in force the delivery situation shows no improvement. One mill has advanced its price on structural material to 4c. Plates continue in heavy demand and are quoted by local mills at 5c. to 5.25c. and higher for fairly early delivery. In structural material the Toledo Bridge & Crane Company has taken 1200 tons for the Film Service building in Detroit, requiring Bethlehem sections, and the American Bridge Company has taken 500 tons for bridges for the Wheeling & Lake Erie Railroad. An eastern railroad is taking bids on 1700 tons for bridge work. An inquiry is pending for 3500 tons of steel for steam shovels for Russia. Hard steel bars are weak and one mill is quoting these as low as 2.75c. Iron bars are firm at 3c., Pittsburgh. The demand for sheets continues active and considerable business is being closed for second-quarter specifications and third-quarter shipments. We quote sheets at 4.75 to 5.50c., Ohio mill, for No. 28 black; 4.50 to 5.50c. for No. 10 blue annealed, and 6.50 to 7.50c. for No. 28 galvanized. Warehouse prices are 4c. for steel bars; 4.10c. for structural material; 5c. for plates; 5c. for hoops and 5c. for blue annealed sheets.

Bolts, Nuts and Rivets.—New inquiry for bolts and nuts, which has been rather light for several weeks, has improved. A spring buying movement has developed among some of the railroads and other consumers. Prices are firm. The demand for rivets continues fairly active and unchanged at 4.25c., Pittsburgh, for structural and 4.35c. for boiler rivets. Bolt and nut discounts are as follows:

Common carriage bolts, $\frac{3}{8}$ x 6 in., smaller or shorter, rolled thread, 40 and 10; cut thread, 40 and 2½; larger or longer, 30 and 5. Machine bolts with h.p. nuts, $\frac{3}{8}$ x 4 in., smaller or shorter, rolled thread, 50; cut thread, 40 and 10; larger or longer, 35 and 5. Lag bolts, cone point, 50. Square and hexagon, h.p. nuts, blank, \$2.50 off the list; tapped, \$2.30 off. C.p.c. and t. hexagon nuts, all sizes, blank, \$2.25 off; tapped, \$2 off. Cold pressed semi-finished hexagon nuts, 50, 10 and 5 off.

Old Material.—The market continues dull but there is an improvement in the demand for cast scrap, due probably to difficulty foundries are having in securing pig iron. The demand for borings and turnings is inactive and prices are easier, sales of both grades being made as low as \$8.75. Trading is mostly between dealers who are still covering on old contracts. Heavy melting steel is firm and sales of the better grade have been made as high as \$24 for delivery to a Cleveland mill. Mills show an indifferent attitude regarding the market and are offering less than current prices for material. We quote, f.o.b. Cleveland, as follows:

Per Gross Ton	
Steel rails	\$21.00 to \$21.50
Steel rails, rerolling	26.00 to 27.00
Steel rails under 3 ft.	26.00 to 26.50
Iron rails	28.00 to 28.50
Steel car axles	47.00 to 48.00
Heavy melting steel	22.00 to 22.50
Carwheels	19.50 to 20.00
Relaying rails, 50 lb. and over	37.00 to 38.00
Agricultural malleable	15.00 to 15.50
Railroad malleable	20.50 to 21.00
Steel axle turnings	16.50 to 17.00
Light bundled sheet scrap	14.50 to 15.00

Per Net Ton	
Iron car axles	\$44.00 to \$45.00
Cast borings	8.75 to 9.00
Iron and steel turnings and drillings	8.75 to 9.00
No. 1 busheling	17.75 to 18.25
No. 1 railroad wrought	24.00 to 25.00
No. 1 cast	17.75 to 18.25
Railroad grate bars	13.00 to 13.25
Stove plate	12.50 to 12.75

St. Louis

ST. LOUIS, Mo., Feb. 26, 1917.

Pig Iron.—Increasing inquiry, of a confidential character, is appearing. A feature of the demand in the small lot class is the call for irons high in silicon and also high in manganese with the apparent purpose of utilizing these in conjunction with scrap material to lower the cost. Sales have been more numerous than for some time, but all below the 300-ton figure and for 1917 delivery. A new inquiry is for 750 tons of Lake Superior charcoal iron which is being held at about \$40, Detroit. Sales of small lots of No. 2 Southern foundry iron have been made at \$26.50 to \$27,

Birmingham, with little prospect of any more being sold without a further advance. Basic needs are understood to be increasing, but none of the big basic buyers are inclined to enter the market yet, though it is known that some consumers of Southern basic are carefully feeling out the situation, with large users of foundry iron doing the same.

Coke.—The chaotic condition grows worse. A car on track in the St. Louis delivery district brought \$19 per ton for the foundry grade, so great was the need of the buyer. The general price for foundry coke, prompt shipment, is about \$13, Connellsburg or Virginia ovens, for best selected 72-hour foundry coke. Virginia coke has been coming through more freely than the Connellsburg. Modifications in the car embargo have been made and assurances given that within another week the situation will be much improved. By-product coke is not being considered as none is available.

Finished Iron and Steel.—Specifications on contracts are more insistent, but traffic conditions have interfered. No new buying of consequence has appeared in either structural material or in steel rails, though buyers would willingly contract into 1918 if a basis could be agreed upon. Movement out of warehouse is naturally very heavy and at firm prices which we quote as follows: Soft steel bars, 3.80c.; iron bars, 3.75c.; structural material, 4.05c.; tank plates, 4.80c.; No. 10 blue annealed sheets, 5.30c.; No. 28 black sheets, cold rolled, one pass, 5.75c.; No. 28 galvanized sheets, 8c.

Old Material.—The inability to move scrap in or out makes the situation unenviable, although there are promises of some relief from the embargo by the end of the present week. To the south there is a little relaxation, but none to the east or north. Foundry grades, rolling mill and steel foundry material would be salable at stiff prices if they could be moved and it is expected that there will be a rush for scrap when the railroad situation permits, as consumers here and outside are known to be using up their yard supplies very rapidly. Light rails for relaying are in very active demand with an accentuated scarcity. The only new list of consequence was one from the Chicago, Burlington and Quincy of about 2500 tons. We quote dealers' prices, f.o.b. customers' works, St. Louis industrial district, as follows:

<i>Per Gross Ton</i>		
Old iron rails	\$26.00 to \$26.50	
Old steel rails, rerolling	26.00 to 26.50	
Old steel rails, less than 3 ft.	27.00 to 27.50	
Relaying rails, standard section, subject to inspection	23.00 to 34.00	
Old carwheels	18.50 to 19.00	
No. 1 railroad heavy melting steel scrap	22.00 to 22.50	
Heavy shoveling steel	19.00 to 19.50	
Ordinary shoveling steel	17.50 to 18.00	
Frogs, switches and guards cut apart	22.00 to 22.50	
Ordinary bundled sheet scrap	13.50 to 14.00	

<i>Per Net Ton</i>		
Iron angle bars	\$26.00 to \$26.50	
Steel angle bars	21.00 to 21.50	
Iron car axles	34.00 to 35.00	
Steel car axles	34.00 to 35.00	
Wrought arch bars and transoms	27.50 to 28.00	
No. 1 railroad wrought	23.50 to 24.00	
No. 2 railroad wrought	22.00 to 22.50	
Railroad springs	22.50 to 23.00	
Steel couplers and knuckles	23.50 to 24.00	
Locomotive tires, 42 in. and over, smooth inside	31.00 to 32.00	
No. 1 dealers' forge	17.50 to 18.00	
Cast iron borings	8.50 to 9.00	
No. 1 busheling	15.50 to 16.00	
No. 1 boilers, cut to sheets and rings	13.00 to 13.50	
No. 1 railroad cast scrap	14.00 to 14.50	
Stove plate and light cast scrap	10.00 to 10.50	
Railroad malleable	15.50 to 16.00	
Agricultural malleable	12.50 to 14.00	
Pipes and flues	14.00 to 14.50	
Heavy railroad sheet and tank scrap	13.50 to 14.00	
Railroad grate bars	11.50 to 12.00	
Machine shop turnings	9.00 to 9.50	
Heavy axle and tire turnings	12.50 to 13.00	

The Chase interests are to build a large office building at Grand and Leavenworth streets, Waterbury, Conn., which will be occupied jointly by the Chase Metal Works, Chase Rolling Mills and Waterbury Mfg. Company. Cass Gilbert, who designed the Waterbury City Hall, is the architect, and the plans call for one of the largest and finest office buildings connected with any Eastern industry.

Birmingham

BIRMINGHAM, ALA., Feb. 26, 1917.

Pig Iron.—The week ended Feb. 24 found the local iron market firm at a minimum of \$25 for any delivery, with \$26 asked and obtained in numerous instances. Much business was done at \$24 in the early part of the week. On Thursday one maker sold 8000 tons for Southern and Middle Western second-half delivery at \$24 and advanced to \$25, making sales at the higher figure as soon as announced. The leading interest, which as late as Feb. 17 spoke of \$23.50 for the first half, now quotes \$25 and \$26 for all deliveries. In fact, distinction in delivery has been withdrawn, there being very little spot and first half to figure on. A lot of 400 to 500 tons of 4 to 5 per cent silicon sold for Middle Western delivery at \$27.50. A large tonnage was booked in February, probably more than the make. The largest foundry-iron maker feels no interest in forward business under \$25 minimum and has made sales at \$25 and even \$26. Stocks were reduced in Alabama in February about 30,000 tons, and free foundry iron is now from 160,000 to 170,000 tons, with 60,000 to 70,000 tons of warrant iron. This condition is considered quite comfortable in face of the demand. The car situation is worse than it has yet been. Foundries north of the Ohio River gateways, as well as in the South, continue to clamor for deliveries and say shut-downs are imminent unless they get metal. So far furnace output has not been affected, raw material being secured to maintain a maximum output. The Mobile Stove & Pulley Works will make 300 12-in. shells for the Government and the Binghamton Machine & Foundry Company is making cast-iron shells for Government target practice. We quote, per gross ton, f.o.b. Birmingham district furnaces, as follows:

No. 1 foundry and soft	\$25.50 to \$26.50
No. 2 foundry and soft	25.00 to 26.00
No. 3 foundry	24.50 to 25.50
No. 4 foundry	24.25 to 25.25
Gray forge	24.00 to 25.00
Basic	25.50 to 26.00
Charcoal	28.00 to 29.00

Cast-Iron Pipe.—Port Arthur was among the points ordering pipe during the week, and the Magnolia and other oil concerns have placed orders for flange pipe with the leading interest. This, with the large Argentine order, and others, will keep its plants in Bessemer, Birmingham and Anniston busy for some time. Fill-in orders from customers who must have pipe constitute the bulk of business. Plant operations are on a large scale. We quote, per net ton, f.o.b. pipe shop yards, as follows: 4-in., \$39; 6-in. and upward, \$36, with \$1 added for gas pipe and extra lengths.

Coal and Coke.—The minimum on spot coke now is \$12 per net ton at oven, and some has sold at \$13. This applies to standard beehive makes. The minimum for long-term contracts for regular customers is \$8.50 to \$9. Furnace coke sells at \$5 to \$6. All kinds of coke are scarce and hard to get. Steam coal sells f.o.b. mines at \$2 to \$3 per net ton, and very little contract coal is done under \$2, which compares with \$1.10 at this time last year. The demand is brisk. Spot coal brings fancy prices according to conditions.

Old Material.—The market has toned up to some extent, owing to the effort of Northern and Eastern concerns to invade the market for supplies to take the place of that under embargo. However, little of this business is placed on account of the embargoes. Heavy melting steel and cast scrap have been more active. We quote, per gross ton, f.o.b. Birmingham scrap yards, prices to purchasers as follows:

Old steel axles	\$34.00 to \$36.00
Old steel rails	19.00 to 19.50
No. 1 wrought	18.00 to 19.00
No. 1 melting steel	15.00 to 15.50
No. 1 machinery	16.50 to 17.00
Carwheels	12.00 to 13.50
Tram carwheels	12.00 to 12.50
Stove plate and light	11.00 to 11.50
Machine-shop turnings and borings	8.00 to 8.50

The establishments under the control of the Ministry of Munitions of Great Britain on Jan. 31 numbered 4719.

San Francisco

SAN FRANCISCO, CAL., Feb. 20, 1917.

The heavy rains of the past week tended to improve the prospects for business in the interior of the State a great deal. The country was getting alarmed at the delay of the winter rains. Local jobbers of steel products are well satisfied now with the outlook as far as the market is concerned, but are not so contented in the matter of supplies. Stocks in some lines are getting very short and there is no material improvement in shipments from the Eastern mills. Prices show a continued upward tendency. A few small strikes of mechanics and laborers in San Francisco and other coast cities are on in the shipbuilding and steel industries, but no serious consequences are expected, as the strikes involve no vital issues. The general hope of the trade is that this country will not become involved in the European war. Business and building enterprises have enough to contend with now in regard to steel materials without a war to further aggravate the situation.

Bars.—Stocks are reported in fair shape, but it is pretty hard to tell the condition of local supplies from day to day. The general demand is strong and as yet deliveries from this point are quite prompt. Much building is under way, and the need for reinforcing bars is heavy. Reinforcing bars remain on a 3.75c. base. Soft steel bars are quoted on a 4.35c. base, and large sizes, over 3-in. round, on a 4.85c. base. Iron bars are quoted at 4.25c.

Structural Material.—Increasing demand is reported and many plans for important structures are under way. An exceptionally large amount of bridge work is coming up, especially in the north. Advancing prices are not retarding building to the extent that would be expected. Plain material is quoted at 4½c. Angles, channels and tees under 3-in. are priced on a 4.65c. base, and over 3-in., 4.75c. flat. I-beams, 4 to 15 in. and 50 to 60 ft. in length, are quoted at 4.75c. flat. The McClintic-Marshall Company has a contract for a 1000-ton bridge job, for the Western Pacific Railroad on the American River, near Sacramento. The Central Iron Works has the contract for supplying approximately 1000 tons of steel for the American National Bank in the course of erection in San Francisco. The Golden Gate Iron Works, having the contract on the California Theater, supplied through Eastern manufacturers, two girders 87½ ft. long and 8 ft. deep, each weighing 75,000 lb. These are the largest single unit girders to be shipped here. The Pacific Coast Steel Company is supplying \$20,000 worth of reinforcing steel for a theater and studio building under erection by the Stability Building Company, Los Angeles.

Plates.—All over the coast shipbuilding operations are going ahead with renewed vigor, notwithstanding the delays on account of deliveries of plates being held up. Several large freighters are being constructed at the yards of Moore & Scott, in Oakland, and advices have just been received from New York that the Union Iron Works has been awarded the contract to build three for British firms. Tank plates are now quoted at 6c. for ¼-in. and heavier. Two weeks ago the price was 5.70c.

Sheets.—The requirements for corrugated galvanized promise to be much heavier than normal this spring. The present demand for blue annealed is strong, and quotations show an advance. For Nos. 12, 14 and 16 the price is 6.25c. Flat galvanized, Nos. 12 and 14, is quoted at 7.74c.

Wrought Pipe.—A 5 per cent advance in price went into effect Feb. 16 in the local jobbing market. Black pipe, ¾-in., is quoted at 5.95c. in small lots and 5.60c. in carloads. Three-quarter-inch galvanized holds at 8.15c. for small lots and at 7.65c. in carloads. Jobbing sales are increasing satisfactorily.

Cast-Iron Pipe.—Municipalities are holding off on contemplated water system improvements. Wooden pipe is a factor in competition which has a considerable bearing, especially in California, where redwood pipe

is widely exploited. For 6-in. and larger, cast-iron pipe sells at \$50 per net ton, f.o.b. San Francisco. While not much tonnage is offering now, the prospects are for a fine year, as it is known that certain important projects will shortly be promoted.

Pig Iron.—The foundries are expressing anxiety over the high cost of pig iron, especially of the best grades, and business is suffering somewhat because of the uncertainty. No. 2 is quoted at \$35, but the highest grade cannot be had in small quantities under \$42 or \$43. Local foundries paid the latter price the past week. Some firms contracted liberally for supplies in advance, but many are not in possession of heavy stocks.

Coke.—For spot delivery coke is sold around \$23 to \$25 per net ton, and is quoted at \$22 and \$22.50 for future delivery.

Ferroalloys.—The constant demand for ferromanganese and the high prices continue to encourage the development of California deposits. St. Louis parties are said to have control of a deposit near Hollister and to be preparing to install an electric furnace to make alloy from the ore.

Old Material.—The demand is stronger than ever. First-class scrap iron brings locally from \$20 to \$23 per net ton, though inferior grades have sold as low as \$14.50. Mild first-class steel scrap has been quoted as high as \$20 per gross ton, but sales this week have been made from \$15 to \$17. Old boiler plate is quoted at lower figures.

New York

NEW YORK, Feb. 28, 1917.

Pig Iron.—The market is difficult to fathom, being full of cross currents. The strength of the situation is expressed in a further advance of \$1 to \$2 per ton by several eastern and central Pennsylvania furnaces. On the other hand, it is significant that iron is still being pressingly offered for resale at Gulf and Atlantic coast ports; and although substantial concessions would be made, it is difficult to move the iron. A wide range in prices expresses the divergence of views between buyers and sellers. Sporadic sales of foundry grades have been made at the extreme levels but some difficulty is encountered in placing contracts at minimum quotations for delivery over the balance of the year. One Connecticut consumer has closed contracts for about 2000 tons half Pennsylvania and half Virginia iron and is still negotiating for an additional 1000 tons in two lots; the purchases thus far made are for delivery from July to October, inclusive. It is difficult to purchase No. 2 X foundry iron from eastern Pennsylvania furnaces under \$33 per ton. Some sales have been made as high as \$35 per ton for shipment over the last half of the year and one lot of 100 tons of high silicon brought \$36 per ton. The resale iron offered in the Buffalo territory has not been disposed of even at concessions at \$1 to \$2 per ton from furnace asking prices. Virginia iron is held at \$30 to \$31.50, at furnace, but there is scarcely enough business to establish reliable prices. Sales of Southern foundry iron for eastern shipment have been made at \$24, Birmingham base, but smaller lots are reported to have brought \$25 and even \$26. Sales of small lots of various foundry grades, aggregating 3000 tons, have been made for shipment into New England, and there are several inquiries for small lots ranging from a few hundred to 600 tons each. The latest prospective business is for 6000 tons of foundry grades for the last quarter of 1917, only a small portion of which is for delivery in the East. Export buying has been light, but another inquiry has just been put out for 30,000 tons for export to Italy, including 20,000 tons of hematite and 10,000 tons of No. 2 Southern foundry; shipment to be made from March to June, inclusive. Low-phosphorus iron is scarce and wanted at approximately \$58 to \$60 per ton. We quote at tidewater for early delivery: No. 1 foundry, \$34 to \$35; No. 2 X, \$33.50 to \$34.50; No. 2 plain, \$33 to \$34; Southern iron at tidewater, \$31 for No. 1 and \$29 to \$30 for No. 2 foundry and No. 2 soft.

Ferroalloys.—Between 2000 and 3000 tons of British ferromanganese for delivery in the last half has been sold in the last week at \$185, seaboard, the new quotation. Very little domestic ferromanganese is reported sold. The quotation of a large Eastern producer is \$250, delivered, for the fourth quarter, \$275 delivered for the third quarter and anywhere from \$275 to \$300 asked for nearby delivery. Spiegeleisen, 20 per cent, is in strong demand, sales having been made for delivery in the first half at somewhere near \$75, furnace. The quotation for the last half is nominal at about \$65, furnace. Reports of inquiries for something like 15,000 tons have not been confirmed. Ferrosilicon, 50 per cent, is still scarce and, in the opinion of some, American consumers are threatened with a serious scarcity. There is no quotation and those having it for sale are securing as high as \$250, delivered, per ton. Ferrotungsten has recently declined in value and is now obtainable at as low as \$2 per lb. of contained tungsten, New York, with the ore concentrates selling at between \$16 and \$17 per unit. Ferrovanadium is quoted at \$2.75 to \$3, Pittsburgh, per pound of contained vanadium. Ferrocortitanium is selling at 8c. per pound in carload lots, 10c. per pound in ton lots and 12½c. per pound in lots less than a ton. Ferrochrome, 60 to 70 per cent, is quoted at 16c. to 20c., New York, per pound of contained chromium.

Structural Material.—Transactions are smaller and inquiries fewer than for several weeks. The St. Louis & San Francisco Railway Company has placed an order for a little over 1000 tons of bridge work with the McClintic-Marshall Company and the Wheeling & Lake Erie has contracted for six bridges, requiring 479 tons, with the American Bridge Company. The Philadelphia & Reading has come into the market for several small bridges, calling for 300 tons, and the Lackawanna railroad has awarded 300 tons to the Fort Pitt Bridge Company. One interesting inquiry calls for 1500 tons of bridge work for export to Norway. Most of the larger contracts being placed are for manufacturing plant extensions. The Worth Steel Company has awarded 2000 tons for a rolling mill building at Claymont, Del., to Lewis F. Shoemaker & Co. Among the other contracts placed were 200 tons for a machine shop at Auburn, N. Y., for McIntosh & Seymour Corporation, awarded to the Lackawanna Bridge Company; 900 tons for a smelter at El Paso, Texas, for the Kansas City Smelting Company, a subsidiary of the American Smelting & Refining Company, placed with the Kansas City Structural Steel Company; 800 tons for the Prince George Hotel, New York, to the Hinkle Iron Company; 250 tons for an extension to the Niles-Bement-Pond plant, Plainfield, N. J., which, it is understood, has gone to Levering & Garrigues Company. Among contracts pending is a bridge for the Boston & Maine requiring 1700 tons of steel, bids upon which will be made to-day. The Brown & Thompson department store, Hartford, requires 1000 tons, and will probably be awarded this week. The Strawbridge & Clothier store, Philadelphia, of steel and concrete construction, requires 200 tons for column cores. Other contracts developing include 200 tons of steel for the Sherman National Bank Building, Thirty-fifth Street and Fifth Avenue; 230 tons for the Dreicer office building on West Fifty-seventh Street; 200 tons for improvement to the Schermerhorn building, 95 Broadway. Among the export contracts pending is one for 5000 tons of beams, channels, tees, angles and plates for Italy. We quote mill shipments of shapes in two to five months at 3.419c. to 4.169c., New York. Warehouse shipments are now at 4.10c., New York.

Bars.—Agricultural implement manufacturers have been quietly but energetically closing contracts for soft steel bars for shipment over the second half of 1917. It is understood that thus far over 250,000 tons have been secured. Most of the independent bar manufacturers are asking from 3c. to 3½c. per pound, Pittsburgh, and several contracts are on the point of being closed. Sales of 7000 tons of alloy steel bars have been made for export. Bar iron has been advanced \$5 per ton. We quote mill shipments of steel bars at \$3.169c. to 3.669c., New York, the lower price for indefinite delivery and the higher for small quantities in, say,

three months. We quote mill shipments of bar iron at 3.419c., New York. Out of warehouse iron bars are 3.70c., and steel bars 4c., New York.

Steel Plates.—Plate mills continue to be overwhelmed with inquiries from shipbuilding interests at home and abroad. It is estimated that fully 300,000 tons of plates could be sold for various deliveries extending over the last quarter of this year, and the whole of 1918 at full prices on domestic account alone. The Cunard Line is reported to have placed a contract for three freight boats of 7500 tons burden each, with the Todd yard at Tacoma, in addition to the five 15,000-ton boats recently placed with the Bethlehem Steel Company. It is understood that most of the plates required for the latter five boats have been put under contract. In the export field Japanese interests are most aggressive, and in the last few days have purchased 13,000 tons of plates in the East at slightly under 6c., Pittsburgh, for shipment over the first half of 1918, and are now negotiating for 10,000 tons at 6c. base for shipment over the second quarter of 1918. Another Japanese interest has purchased 1150 tons of plates at 6½c. per pound, together with 409 tons of marine shapes. Other Japanese inquiries include one lot of 4900 tons made up of 3500 tons of plates and 1400 tons of shapes. Still another is for 7000 tons of plates and 2800 tons of shapes. In the aggregate Japanese inquiries amount to 50,000 tons. There are also new inquiries from Italy, including one lot of 4000 tons of plates, another for 3400 tons of shapes, and another for 600 tons of plates and shapes. An interesting inquiry from Norway is for boiler plates for torpedo boats. English interests have put out another inquiry for 1500 tons of plates and shapes, understood to be for France, and there are several inquiries from the River Platte district, including ship plates and locomotive firebox steel for Chile. French inquiries for about 25,000 tons of plates are still unsatisfied and new British inquiries call for 1000 tons of plates and 1500 tons of plates and shapes. We quote best deliveries on universal plates at 4.669c. to 5.169c., New York, ordinary tank plates at 5.169c., and ship plates at 6.169c., but indefinite delivery plates at 3.919c., New York. Out of store we quote 5c. and higher.

Rails.—Several large export inquiries for standard and medium section rails for export to France are still in the market, and contracts are expected to be closed in the near future. Several relatively small lots for export have been sold at between \$55 and \$60 per ton at mill. Some 57-lb. Russian seconds are on the market in addition to the tonnage sold for direct export.

Cast-Iron Pipe.—The city of Boston will open bids March 6 on 425 tons of 4 and 12-in., principally the larger size. Rochester, N. Y., will open bids March 7 on 1065 tons of pipe and fittings ranging from 6 to 30 in., but this is no part of the large job on which plans are now being prepared and which will shortly be ready for advertising proposals. Inquiry from private buyers is increasing as the weather becomes more favorable for outdoor work. Carload lots of 6-in., class B and heavier, are selling at \$41.50 per net ton, tidewater, with class A and gas pipe taking an extra of \$1 per ton.

Old Material.—Conditions are steadily improving, both as to demand and price. March is usually a month of active buying, with increasing strength in prices, and dealers are looking forward to a more active movement. Steel scrap continues in demand for export and domestic consumers are also showing more interest in the market. A phenomenal demand has developed for railroad wrought scrap. Such commodities as borings and turnings are in better demand at higher prices. Brokers quote buying prices as follows to local dealers and producers, per gross ton, New York:

Heavy melting steel scrap.....	\$20.00 to \$20.50
Relying rails	40.00 to 41.00
Rerolling rails	29.00 to 30.00
Iron and steel car axles (for export)	38.00 to 40.00
No. 1 railroad wrought	27.00 to 28.00
Wrought-iron track scrap	24.00 to 25.00
No. 1 yard wrought, long	23.00 to 24.00
Light iron	7.00 to 8.00
Cast borings (clean)	13.00 to 12.50
Machine shop turnings	11.50 to 12.00
Mixed borings and turnings	12.00 to 12.50
Wrought-iron pipe (not galvanized or enameled)	16.00 to 16.50

Cast scrap is in better demand. It continues to gain in strength, but is not yet as high as it would appear to be worth in comparison with prices at which pig iron is selling. The prices given below are such as are paid by consumers purchasing in good quantities, although foundries in New York City and Brooklyn are able to secure small lots from nearby dealers at \$1.50 to \$2 less per gross ton:

No. 1 cast	\$21.50 to \$22.00
No. 2 cast	19.00 to 20.00
Stove plate	14.50 to 15.00
Locomotive grate bars	15.00 to 15.50
Old carwheels	21.00 to 21.50
Malleable cast (railroad)	20.00 to 20.50

British Steel Market

Little Demand for American Steel—Ferromanganese and Tin Plate Firm

LONDON, ENGLAND, Feb. 28, 1917—(By Cable).

The demand for pig iron is generally good, especially for hematite iron. Tin plates are firm. America is inquiring for distant shipments of ferromanganese, which is also firm. American semi-finished steel is dull and c.i.f. offers are suspended. We quote as follows:

Tin plates, coke, 14 x 20, 112 sheets, 108 lb., f.o.b. Wales, 27s.

Steel black sheets, No. 28, export, f.o.b. Liverpool, £19 5s.

Hematite pig iron, f.o.b. Tees, 142s. 6d.

Sheet bars (Welsh) delivered at works in Swansea Valley, £15 5s. nominal.

Ferromanganese, £37 nominal.

Ferrosilicon, 50 per cent, c.i.f., £35 upward.

New Contracts for Heroult Furnaces

Licenses for the installation of Heroult electric steel furnaces have been made recently by the United States Steel Corporation as follows:

The Heppenstall Forge & Knife Company, Pittsburgh, Pa., one 6-ton furnace for making forging ingots from cold scrap.

The Carpenter Steel Company, Reading, Pa., two more 6-ton furnaces for making special steels from cold scrap. These are in addition to one 6-ton furnace already operating and one of the same size being installed.

The Sizer Forge Company, Buffalo, N. Y., two 10-ton furnaces for making forging ingots from cold scrap.

The installation of these five furnaces brings the total number of Heroult furnaces, operating or contracted for, in the United States and Canada to 108, of which 24 have been sold since Jan. 1, 1917. There are now more Heroult furnaces credited to the United States and Canada than to all the rest of the world put together.

The 20-ton furnace which is operating at the plant of the Carnegie Steel Company, Duquesne, Pa., is now rated as a 30-ton furnace. Since about the middle of November this furnace has been successfully operating and is producing about 30 to 32 tons per heat. It has the distinction of being the largest electric steel furnace operating in the world.

The Greaves-Etchells Electric Furnace

Three Greaves-Etchells electric steel furnaces were started in England in January, 1917, as follows, according to a statement sent to THE IRON AGE:

One 3-ton furnace by Walter Spencer & Co., Ltd., Sheffield, for making alloy and tool steels.

One 10-cwt. furnace by the Apex Steel Company, Ltd., Sheffield, for the manufacture of high-speed tool steels, etc.

One special furnace by the Daimler Company, Ltd., Coventry, for making cast-iron and special steel castings.

This British furnace was described in THE IRON AGE, Jan. 11, 1917.

The Buena Vista furnace of the Alleghany Ore & Iron Company, Buena Vista, Va., has been blown out and will be inactive for about 10 days to permit of the repair of a hot spot which threatened to burn through.

Iron and Industrial Stocks

NEW YORK, Feb. 28, 1917.

While transactions in stocks have been of but moderate volume, fluctuations have been quite wide in some, owing to the rapidly changing opinions of speculators and investors regarding the international situation. Much more attention is being given to possibilities growing out of our unsatisfactory relations with Germany than to actual merits of securities themselves. It is conceded that many of the industrial stocks are worth much more than the prices at which they are being sold. The range of prices on active iron and industrial stocks from Wednesday of last week to Tuesday of this week was as follows:

Allis-Chal., com..	25 1/4 - 25 7/8	Int. Har. Corp., com.	..... 79 - 81
Allis-Chal., pref..	82 1/2	Int. Har. Corp., pref.	..... 111
Am. British Mfg., com.	7 - 9	La Belle Iron, com.	..... 82 1/2 - 86
Am. Can., com..	42 3/4 - 45 1/2	Lacka. Steel, com.	..... 77 1/2 - 81 1/2
Am. Can., pref..	107 - 107 1/2	Lake Sup. Corp., com.	..... 20 1/2 - 22 1/2
Am. Car & Fdy., com..	62 1/2 - 65 1/2	Lima Loco, com.	..... 57 - 58 1/2
Am. Car & Fdy., pref.	116 1/2	Lukens, com.	..... 38 - 39
Am. Loco., com..	69 1/2 - 72 1/2	Lukens, 1st pref.	..... 99 - 99 1/2
Am. Loco., pref..	103 1/4 - 104 1/4	Midvale Steel, com.	..... 53 1/2 - 56 1/2
Am. Rad., com..	435 - 445	Nat-Acme, com.	..... 34 - 36
Am. Ship, com..	62 - 62 1/2	Nat. En. & Stm., com.	..... 31 1/4 - 33 1/2
Am. Ship, pref..	94 1/2	Nat. En. & Stm., pref.	..... 96
Am. Steel Fdries, com..	60 1/4 - 63	N. Y. Air Brake, com.	..... 146 1/2 - 148
Bald. Loco., com.	51 1/2 - 54 1/2	Nova Scotia Stl., com.	..... 105 - 106
Bald. Loco., pref.	100 1/4 - 101 1/2	Pitts. Steel, com.	..... 100 - 100 1/4
Beth. Steel, com.	129 - 132	Pressed Stl., com.	..... 75 1/2 - 77 1/2
Beth. Steel,		Pressed Stl., pref.	..... 104
Class B	..... 112 1/2 - 120	Ry. Steel Spring, com.	..... 48 - 50
Cambria Steel	..... 102 1/2	Republic, com.	..... 76 1/4 - 80
Charcoal Iron, com.	..... 7 1/2 - 7 1/2	Republic, pref.	..... 101 1/2 - 102
Charcoal Iron, pref.	..... 6 1/2	Sloss, com.	..... 60 - 63
Chic. Pneu. Tool, com.	68 1/2 - 70	Superior Steel, com.	..... 31 - 32
Colo. Fuel, com.	46 - 47 1/2	Superior Steel, 1st pref.	..... 100
Cruc. Steel, com.	64 - 67 1/2	Transue-Williams, com.	..... 42
Cruc. Steel, pref.	..... 112 1/2	Un. Alloy Steel, com.	..... 43 1/4 - 44 1/2
Deere & Co., pref.	96 1/4 - 97 1/2	U. S. Pipe, com.	..... 18 1/2 - 19 1/2
Driggs-Seabury	..... 51 - 52 1/2	U. S. Steel, com.	..... 106 1/4 - 109 1/2
Gen. Electric	..... 162 - 164	U. S. Steel, pref.	..... 117 1/2 - 118 1/2
Gt. No. Ore Cert.	31 1/2 - 33 1/2	Va. I. C. & Coke, com.	..... 55 - 57 1/2
Gulf States Stl.	..... 107 - 114	Warwick, com.	..... 9 - 9 1/2
Int. Har. of N. J., com.	..... 115 1/2 - 117 1/2	Westing. Elec., com.	..... 48 1/4 - 50 1/2
Int. Har. of N. J., pref.	..... 119 1/2		

Dividends

The Driggs-Seabury Ordnance Company, regular quarterly 1 1/4 per cent on the first preferred and 1 1/2 per cent on the second preferred stock, both payable March 15.

The Inland Steel Company, regular quarterly, 5 per cent, payable March 1.

The Moline Plow Company, regular quarterly, 1 1/4 per cent on the first preferred stock, payable March 1.

The National Enameling & Stamping Company, 4 per cent on the common stock, payable 2 per cent May 15 and 2 per cent Nov. 15, also 7 per cent on the preferred stock, payable 1 1/4 per cent March 31, June 30, Sept. 29 and Dec. 31.

The New York Air Brake Company, regular quarterly, 2 1/2 per cent, and extra 2 1/2 per cent, payable March 23.

The Underwood Typewriter Company, regular quarterly, 1 1/2 per cent on the common and 1 1/4 per cent on the preferred stock, payable April 1.

The LaBelle Iron Works, regular quarterly, 1 per cent and extra 2 per cent, on the common stock, payable April 1.

Record Manganese Ore Imports

Manganese ore imports into the United States in 1916 not only exceeded all former records but were greater than the estimates of the most optimistic. The December imports of 49,796 gross tons bring the total for the year to 576,321 tons, as against 313,985 tons in 1915 and 283,294 tons in 1914. This is more than double the 1914 total and nearly equaled the British imports in 1913 of 601,000 tons. The largest month in 1916 was July, with 81,942 tons, and the smallest February, with 8685 tons. The December imports ranked sixth in order of magnitude. The value of the 1916 imports is returned as \$8,666,179. The British imports of this ore in 1916 were only 439,509 gross tons, valued at about \$11,500,000.

The Railway Storekeepers' Association, W. A. Summerhays, president, Illinois Central Railroad, Chicago, will hold its fourteenth annual convention at Chicago, May 21-23. Among the reports to be given will be those on "The Handling of Rail" and "The Reclamation of Scrap."

Finished Iron and Steel f.o.b. Pittsburgh

Freight rates from Pittsburgh in carloads, per 100 lb.: New York, 16.9c.; Philadelphia, 15.9c.; Boston, 18.9c.; Buffalo, 11.6c.; Cleveland, 10.5c.; Cincinnati, 15.8c.; Indianapolis, 17.9c.; Chicago, 18.9c.; St. Louis, 23.6c.; Kansas City, 43.6c.; Omaha, 43.6c.; St. Paul, 32.9c.; Denver, 68.6c.; New Orleans, 30.7c.; Birmingham, Ala., 45c. Denver, pipe, 76.1c., minimum carload, 46,000 lb.; structural steel and steel bars, 83.6c., minimum carload, 36,000 lb. Pacific coast (by rail only), pipe, 65c.; structural steel and steel bars, 75c., minimum carload, 50,000 lb.; structural steel and steel bars, 80c., minimum carload, 40,000 lb. No freight rates are being published via the Panama Canal, as the boats are being used in transatlantic trade.

Structural Material.—I-beams, 3 to 15 in.; channels, 3 to 15 in.; angles, 3 to 6 in. on one or both legs, $\frac{1}{4}$ in. thick and over, and zees 3 in. and over, 3.25c. to 3.50c. Extras on other shapes and sizes are as follows:

	Cents per lb.
I-beams over 15 in.	.10
H-beams over 18 in.	.10
Angles over 6 in., on one or both legs.	.10
Angles, 3 in. on one or both legs less than $\frac{1}{4}$ in. thick, as per steel bar card, Sept. 1, 1909.	.70
Tees, structural sizes (except elevator, handrail, car truck and conductor rail).	.05
Channels and tees, under 3 in. wide, as per steel bar card, Sept. 1, 1909.	.20 to .80
Deck beams and bulb angles.	.30
Handrail tees.	.75
Cutting to lengths, under 3 ft. to 2 ft. inclusive.	.25
Cutting to lengths, under 2 ft. to 1 ft. inclusive.	.50
Cutting to lengths, under 1 ft.	.155
No charge for cutting to lengths 3 ft. and over.	

Plates.—Tank plates, $\frac{1}{4}$ in. thick, 6 in. up to 100 in. wide, 3.75c. to 5c., base, net cash, 30 days, or $\frac{1}{2}$ of 1 per cent discount in 10 days, carload lots. Extras are:

Quality Extras	Cents per lb.
Tank steel	Base
Fressing steel (not flange steel for boilers).	.10
Boiler and flange steel plates.	.15
"A. B. M. A." and ordinary firebox steel plates.	.20
Still bottom steel.	.30
Locomotive firebox steel	.50
Marine steel, special extras and prices on application.	

Gage Extras	Cents per lb.
Rectangular, $\frac{1}{4}$ in. thick, over 6 in. wide to 100 in. wide. Base	
Lighter than $\frac{1}{4}$ in., to $\frac{3}{16}$ in., up to 72 in. wide.	.10
*Lighter than $\frac{3}{16}$ in., including $\frac{3}{16}$ in., over 72 in. to 84	.20
*Lighter than $\frac{3}{16}$ in., including $\frac{3}{16}$ in., over 84 in. to 96	.30
*Lighter than $\frac{3}{16}$ in., including $\frac{3}{16}$ in., over 96 in. to 100	.40
*Lighter than $\frac{3}{16}$ in., including $\frac{3}{16}$ in., over 100 in. to 102	.45
Lighter than $\frac{3}{16}$ in., including No. 8, up to 72 in. wide	.15
*Lighter than $\frac{3}{16}$ in., including No. 8, over 72 in. to 84	.25
*Lighter than $\frac{3}{16}$ in., including No. 8, over 84 in. to 96	.35
Lighter than No. 8, including No. 10, up to 60 in. wide.	.30
Lighter than No. 8, including No. 10, over 60 in. to 64..	.35
Up to 72 in. and not less than 10.2 lb. per sq. ft. will be considered $\frac{1}{4}$ in.	
Over 72 in. must be ordered $\frac{1}{4}$ in. thick on edge, or not less than 11 lb. per sq. ft. to take base price.	
Over 72 in. wide, ordered less than 11 lb. per sq. ft., down to weight of $\frac{3}{16}$ in., take price of $\frac{3}{16}$ in.	
Over 72 in., ordered weight $\frac{3}{16}$ in., take No. 8 price.	
Over 72 in., ordered weight No. 8, take No. 10 price.	

Width Extras	Cents per lb.
Over 100 in. to 110 in. inclusive.	.05
Over 110 in. to 115 in. inclusive.	.10
Over 115 in. to 120 in. inclusive.	.15
Over 120 in. to 125 in. inclusive.	.25
Over 125 in. to 130 in. inclusive.	.50
Over 130 in.	1.00

Length Extras	Cents per lb.
Universal plates 80 ft. long up to 90 ft. long.	.05
Universal plates 90 ft. long up to 100 ft. long.	.10
Universal plates 100 ft. long up to 110 ft. long.	.20

Cutting Extras	Cents per lb.
No charge for rectangular plates to lengths 3 ft. and over.	
Lengths under 3 ft. to 2 ft. inclusive.	.25
Lengths under 2 ft. to 1 ft. inclusive.	.50
Lengths under 1 ft.	1.55
Circles 3 ft. in diameter to 100 in.	.30
Circles over 100 to 110 in. (width extra)	.35
Circles over 110 to 115 in. (width extra)	.40
Circles over 115 to 120 in. (width extra)	.45
Circles over 120 to 125 in. (width extra)	.55
Circles over 125 to 130 in. (width extra)	.80
Circles over 130 in. (width extra)	1.30
Circles under 3 ft., to 2 ft., inclusive.	.55
Circles under 2 ft., to 1 ft., inclusive.	.80
Circles under 1 ft.	1.85
Half circles take circle extras.	
Sketches not over four straight cuts, inc. straight taper	.10
Sketches having more than four straight cuts.	.20
Plates sheared to a radius take complete circle extras.	

*Including extra for width.

Wire Rods.—Including chain rods, \$80.

Wire Products.—Prices to jobbers, effective Nov. 27: fence wire Nos. 6 to 9, per 100 lb., terms 60 days or 2 per cent discount in 10 days, carload lots, annealed, \$2.95; galvanized, \$3.65. Galvanized barb wire and

staples, \$3.85; painted, \$3.15. Wire nails, \$3. Galvanized nails, 1 in. and longer, \$2 advance over base price; shorter than 1 in., \$2.50 advance over base price. Cement-coated nails, \$2.90. Woven wire fencing, 53 per cent off list for carloads, 52 off for 1000-rod lots, 51 off for less than 1000-rod lots.

Wrought Pipe.—The following are the jobbers' carload discounts on the Pittsburgh basing card in effect from Feb. 14, 1917, all full weight:

Steel		Butt Weld		Iron	
Inches	Black	Galv.	Inches	Black	Galv.
$\frac{1}{8}$, $\frac{1}{4}$ and $\frac{3}{8}$...	.55	28 $\frac{1}{2}$	$\frac{1}{8}$ and $\frac{1}{4}$...	.44	.17
$\frac{1}{2}$...	.59	44 $\frac{1}{2}$	$\frac{3}{8}$...	.45	.18
$\frac{3}{4}$ to 3...	.62	48 $\frac{1}{2}$	$\frac{1}{2}$...	.49	.31
			$\frac{3}{4}$ to 1 $\frac{1}{2}$...	.52	.38

Lap Weld		Reamed and Drifted	
2...	55	1 $\frac{1}{4}$...	38
$\frac{1}{2}$ to 6...	58	45 $\frac{1}{2}$	44
7 to 12...	55	41 $\frac{1}{2}$	45
13 and 14...	45 $\frac{1}{2}$	2 $\frac{1}{2}$ to 4...	47
15...	43	4 $\frac{1}{2}$ to 6...	47
		7 to 12...	46

Butt Weld, extra strong, plain ends		Lap Weld, extra strong, plain ends	
1 $\frac{1}{8}$, $\frac{1}{4}$ and $\frac{3}{8}$...	.51	1 $\frac{1}{8}$, $\frac{1}{4}$ and $\frac{3}{8}$...	.44
$\frac{1}{2}$...	.56	40 $\frac{1}{2}$	.33
$\frac{3}{4}$ to 1 $\frac{1}{2}$...	.60	47 $\frac{1}{2}$	.39
2 to 3...	.61	48 $\frac{1}{2}$	.40

Butt Weld, extra strong, plain ends		Lap Weld, extra strong, plain ends	
2...	53	1 $\frac{1}{4}$...	.40
$\frac{1}{2}$ to 4...	56	44 $\frac{1}{2}$	.45
$\frac{3}{4}$ to 6...	55	43 $\frac{1}{2}$	.47
7 to 8...	51	37 $\frac{1}{2}$	.49
9 to 12...	46	32 $\frac{1}{2}$	.48
		7 to 8...	.42
		9 to 12...	.37

To the large jobbing trade an additional 5 per cent is allowed over the above discounts, which are subject to the usual variation in weight of 5 per cent. Prices for less than carloads are two (2) points lower basing (higher price) than the above discounts on black and three (3) points on galvanized, but in some sections of the country discounts on less than carloads are three (3) points less (higher price) than the carload discount on both black and galvanized steel pipe.

On butt and lap weld sizes of black iron pipe, discounts for less than carload lots to jobbers are four (4) points lower (higher price) than carload lots, and on butt and lap weld galvanized iron pipe are five (5) points lower (higher price).

Boiler Tubes.—Discounts on less than carloads, freight to be added, effective from Nov. 1, 1916, except 3 to 4 $\frac{1}{2}$ in. steel from Nov. 20, are as follows:

Lap Welded Steel	Standard Charcoal Iron
1 $\frac{1}{2}$ in.	31
1 $\frac{3}{4}$ and 2 in.	43
2 $\frac{1}{4}$ in.	40
2 $\frac{1}{2}$ and 2 $\frac{3}{4}$ in.	46
3 and 3 $\frac{1}{4}$ in.	46
3 $\frac{1}{2}$ to 4 $\frac{1}{2}$ in.	46
5 and 6 in.	45
7 to 13 in.	42

Locomotive and steamship special charcoal grades bring higher prices.
1 $\frac{1}{4}$ in., over 18 ft., and not exceeding 22 ft., 10 per cent net extra.
2 in. and larger, over 22 ft., 10 per cent net extra.

Sheets.—Makers' prices for mill shipments on sheets of United States standard gage, in carload and larger lots, are as follows, 30 days net, or 2 per cent discount in 10 days:

Blue Annealed Sheets	Cents per lb.
Nos. 3 to 8...	4.75 to 5.00
Nos. 9 to 12...	4.50 to 4.75
Nos. 13 to 16...	4.25 to 4.50

Nos. 17 and lighter gages are based on \$4.75 per 100 lb. for No. 28 Bessemer black sheets.

Box Annealed Sheets, Cold Rolled	Cents per lb.
Nos. 17 to 21...	4.55 to 4.80
Nos. 22 and 24...	4.60 to 4.85
Nos. 25 and 26...	4.65 to 4.90
No. 27...	4.70 to 4.95
No. 28...	4.75 to 5.00
No. 29...	4.80 to 5.05
No. 30...	4.90 to 5.15

Galvanized Sheets of Black Sheet Gage	Cents per lb.
Nos. 10 and 11...	5.50 to 5.75
Nos. 12 to 14...	5.60 to 5.85
Nos. 15 and 16...	5.85 to 6.00
Nos. 17 to 21...	5.90 to 6.15
Nos. 22 and 24...	6.05 to 6.30
Nos. 25 and 26...	6.20 to 6.45
No. 27...	6.25 to 6.50
No. 28...	6.50 to 6.75
No. 29...	6.65 to 6.90
No. 30...	6.80 to 7.05

Tin Mill Black Plate	Cents per lb.
Nos. 15 and 16...	4.30 to 4.55
Nos. 17 to 21...	4.35 to 4.60
Nos. 22 to 24...	4.40 to 4.65
Nos. 25 to 27...	4.45 to 4.70
No. 28...	4.50 to 4.75
No. 29...	4.55 to 4.80
No. 30...	4.55 to 4.80
Nos. 30 $\frac{1}{2}$ and 31...	4.60 to 4.85

Metal Markets

The Week's Prices

Cents Per Pound for Early Delivery

Feb.	Lake	Electro-	Tin,	Lead		Spelter	
			New	New	St.	New	St.
21.....	36.00	36.00	48.75	9.62½	9.37½	10.75	10.50
22.....							
23.....	36.00	36.00	49.25	9.75	9.50	10.75	10.50
24.....	36.50	36.50		9.75	9.62½	10.75	10.50
26.....	36.50	36.50	50.00	9.75	9.62½	10.75	10.50
27.....	36.50	36.50	50.50	9.75	9.62½	10.75	10.50

NEW YORK, Feb. 28, 1917.

Copper continues strong with prices largely nominal. Tin is higher because of uncertainties in transatlantic shipping conditions. Lead is coming a little more freely from the West, but prices for nearby metal are high. Spelter is quiet and the market has not changed. Spot antimony is inactive and a little easier at 31c.

New York

Copper.—The market is quiet, almost to the extent of making prices nominal, but there is enough doing to establish a level. One or two cases have come to light where consumers of electrolytic, being unable to find that grade, bought Lake for March and April delivery, paying 36.50c. to 36.75c. April electrolytic has been offered at 35.50c., May at 35c., June at 34.50c., third quarter at 32c. and August and September at 31.50c. The producers are not supposed to be selling for delivery before July, but nevertheless they are offering some copper occasionally on the account of consumers. The general aspect of the market is one of waiting. Consumers are buying only against contracts, and are even proceeding slowly in this direction. Existing prices restrain all buying except that absolutely necessary. The London market for spot electrolytic is £4 higher at £151. The exports Feb. 1 to 27 totaled 24,450 tons.

Tin.—Although no ships carrying tin have been lost since the present submarine campaign started, those who deal in tin have been made apprehensive over the extent to which the tonnage of destroyed ships is mounting. Their fears are the primary reason for a stronger market in the past few days, spot Straits being held yesterday at 50.50c., against 48.75c., a week previous. Consumers are using more Banca, Chinese, Australian and Bolivian tin than they usually do. On Feb. 21 probably 200 tons of Straits and Banca changed hands, the positions ranging from early shipment from London to metal ex steamer at dock. On Feb. 26 a fairly good day was experienced, between 200 and 300 tons changing hands. Early on that day dealers were active buyers, importers also showed a disposition to buy, while consumers came in the market too late, as there were but few sellers. On Saturday a quiet business was done in futures. On Monday there was a little spot business, and yesterday the market was quiet with offerings at 50.50c. Arrivals this month total 3655 tons, and there is afloat 3323 tons.

Spelter.—The inactivity in this metal and its complete failure to participate in the strength of copper constitute a puzzle to the trade. Consumers are showing practically no interest that amounts to anything. In the latter part of last week there was some inquiry, but Monday and yesterday most of that disappeared. For some days the New York quotation has been about 10.75c., and that at St. Louis about 10.50c. The producers, though willing to sell sparingly for nearby, do not want to commit themselves into the future at present prices. They say there is nothing in it, for, with the ore around \$90 per ton, it costs over 10c. per lb. to make spelter. April is quoted at 10.37½c., St. Louis, and second quarter at 9.75c., St. Louis.

Lead.—Although shipments from the West have arrived a little more freely in the past week, the scarcity

of nearby metal has not been sufficiently relieved and spot is still quoted at 10.50c. to 10.75c., New York. March is around 9.75c., New York. For April shipment the quotation is about 9c., St. Louis. With all of these prices, so little is doing that they are practically nominal. Nearby cannot be had with certainty, and buyers have been reluctant to go to April and beyond, although yesterday there was a slight improvement in this respect. Here and there consumers have been willing to sell from their stock on the ground that it was more profitable to sell the metal at prevailing prices than to use it in manufacture. The exports from Feb. 1 to 27 totaled only 377 tons. The London spot quotation is unchanged at £30 10s.

Antimony.—Spot Chinese and Japanese grades are quoted at 31c. to 32c. Business is light. Despite the reports of a shortage in the metal, Government figures show that Feb. 1 the stock of antimony, regulus and crude, in bond in New York warehouses was 1,154,794 lb. Antimony for future shipment from the Far East is held at 15.12½c. to 15.50c., the first for April and the latter price for February.

Aluminum.—No change is reported, the market being firm at 57c. to 59c. per lb. for No. 1 virgin metal, 98 to 99 per cent pure.

Old Metals.—The market continues strong. Dealers' selling prices are as follows:

	Cents per lb.
Copper, heavy and crucible.....	\$33.00 to \$34.00
Copper, heavy and wire.....	31.50 to 32.50
Copper, light and bottoms.....	26.00 to 26.50
Brass, heavy	19.50 to 20.00
Brass, light	15.00 to 15.50
Heavy machine composition	26.00 to 26.50
No. 1 yellow rod brass turnings.....	19.25 to 19.75
No. 1 red brass or composition turnings.....	21.00 to 23.00
Lead, heavy	8.25
Lead, tea	7.75
Zinc	9.00

Chicago

FEB. 27.—The very strong tone of the non-ferrous metal market is being maintained without exception, although prices, with the exception of tin, show little change from a week ago. Metal, however, is more difficult to secure and quotations are in a degree nominal. We quote: Casting copper, 34c.; Lake copper, 36c.; tin, carloads, 50.75c., and small lots, 52.75c.; lead, 9.75c. to 10c.; spelter, 10.50c. to 10.75c.; sheet zinc, 21c.; Cookson's antimony, 50c.; other grades, 34c. to 35c. On old metals we quote buying prices for less than carload lots as follows: Copper wire, crucible shapes, 27.50c.; copper bottoms, 25.50c.; copper clips, 26.50c.; red brass, 25c.; yellow brass, 19c.; lead pipe, 8c.; zinc, 7.50c.; pewter, No. 1, 30c.; tinfoil, 34c.; block tin pipe, 39c.

St. Louis

FEB. 26.—Metals have been firmer and higher, but the advance on the Missouri product would have been sharper, it is thought, if cars could be made available to move it. Quotations to-day on carload lots were: Lead, 9.50c.; spelter, 10.50c. In less than carload lots the figures were: Lead, 10.50c.; spelter, 12.50c.; tin, 55c.; Lake copper, 38c.; electrolytic copper, 37.50c.; Asiatic antimony, 38c. In the Joplin district zinc blende ranged from \$80 to \$90 per ton, with the average for the district for the week \$84; calamine, \$45 to \$55, with the average \$48; lead ore, firm with the greater part of the sales at \$122.50 and the average \$113. On miscellaneous scrap metals we quote dealers' buying prices as follows: Light brass, 12.50c.; heavy yellow brass, 14c.; heavy red brass and light copper, 20c.; heavy copper and copper wire, 23.50c.; pewter, 25c.; tinfoil, 35c.; lead, 6c.; zinc, 7c.; tea lead, 4c.

The economic principles involved in the manufacture of munitions, such as questions relating to financing, specifications, inspection, design of parts for quantity manufacture and principles of organization which have been found successful, will be among the topics to be discussed at the spring meeting of the American Society of Mechanical Engineers to be held in Cincinnati, May 21 to 24, inclusive.

British Munition Plants After the War

In discussing the possible uses after the war for the additional plants and machinery that have been created for the production of munitions in Great Britain, the London *Times* calls attention to their enormous importance as a national asset and to the thought which their destiny has stimulated in the engineering trades. It further states:

"Perhaps the most pregnant of the many suggestions are those which contemplate these factories as the new homes of old and smaller works. Among the respects in which British manufacturers have been at a disadvantage compared with their competitors in the United States is the nature of their premises. The old establishment that has given them experience and connection has also given them old premises, round which have grown up houses which now are themselves old, and are often placed in neighborhoods which are as little suited to the best development of the workers and their families as the old works and some of the old prejudices are to the efficiency of the business. To move these works from the slums in which many of them are placed into neighborhoods with light and air and grass, and to transfer their machinery from shops that have grown up without plan into premises designed for efficient handling and 'routing' would be to give the workers and the enterprise a fresh lease of life."

"Some point out that the design of these new works is particularly adapted to subdivision and suggest that their utility would be all the wider and more general if they were divided into separate occupations and used by firms of whom each could specialize in the quantity production of individual parts, and one or more in the assembling of them. This method has been used largely and successfully by American manufacturers, sometimes further apart from each other than these works would be. The advance which has been made for war manufactures in the use of limit gages and the production of interchangeable parts has placed British engineering in an entirely new position for adopting this method of manufacture generally. Indeed, judging from some of the work that has been imported into this country from the United States during the war, we may perhaps have caught up or passed the average American works in this essential respect."

Women in British Engineering Work

The British Ministry of Munitions is reported as extending its plans to employ women in engineering work. Classes for training in setting-up and skilled operating of various types of machines are being held in London and appeals are made to women of good education and physique, between 20 and 35 years of age, to undertake the training. The course will last from eight to nine weeks. Maintenance grants will be paid during this period, and those who become fully proficient for service in aero-engine or other munition works may expect a minimum wage of £2 per week. Candidates must be prepared to accept employment in any factory to which they may be sent on the completion of their training and to work during the usual factory hours.

Midvale Buys More Coal Lands

On Feb. 27 the purchase was consummated by the Midvale Steel & Ordnance Company of 15,200 acres of coal lands in Westmoreland and Washington counties, Pennsylvania, formerly owned by the Pittsburgh Westmoreland Coal Company. The property adjoins the more than 5000 acres of coal property acquired a few months ago by the Midvale Company from the Marianna Coal Company. The last purchase includes also 8 mines and 300 coke ovens and, it is figured, puts the company in a strong position, as regards a supply of coking coal, for future extensions, let alone present needs.

Dover furnace, Canal Dover, Ohio, operated by M. A. Hanna & Co., was blown in Feb. 23 after being out for some time for relining. It will be operated on basic iron.

Bonuses, Advances and Strikes

On Jan. 1 a dual bonus plan based upon regular attendance and length of service was put into effect by the Timken-Detroit Axle Company, Detroit. For the first 30 days of full attendance, without being late and without stopping before quitting time, a bonus of 3 per cent will be paid upon the straight time earnings; for second 30 days, 4 per cent; third successive 30 days, 5 per cent, and 5 per cent thereafter for continuing perfect attendance. One infraction of the attendance rule, except where absent upon the authority of a superior, will forfeit the bonus for the preceding period of the month and the employee must start over again at the lowest per cent. Starting Jan. 1, a bonus will also be paid on length of service, as follows: Six months' continuous service, 1½ per cent of earnings for the first quarter of the year, paid April 25; one year continuous service, 2 per cent; two years, 4 per cent; three years, 6 per cent; four years, 8 per cent; five years and thereafter, 10 per cent. The service bonus will be paid April 25, July 25, Oct. 25 and Dec. 25, on the earnings of the preceding quarter. The regular attendance bonus will be paid upon the tenth of each month for the preceding calendar month. If any employee is temporarily laid off because of slack work, but is not taken off the payroll, he will continue on the service bonus plan, and will receive the bonus based on the equivalent of his average earnings covering the period he is laid off. The bonus given in this way is considered as a retainer and will not be paid unless the employee returns to work immediately upon notice from the company, when it will be included with his first attendance bonus after his return. The payment of Dec. 25 shall include the earnings through Dec. 15, and the bonus on the last pay in December will be carried to the next quarter.

The Pacific Coast Steel Company shut down its South San Francisco mills Feb. 17, as the result of a strike of laborers at the plant. It is understood that the company has taken advantage of the situation to make some extensive alterations. The laborers demanded \$2.50 for an 8-hr. day. They are, it is understood, receiving \$2.25 for a 10-hr. day.

The Myerstown Foundry & Mfg. Company, Lebanon, Pa., has announced a 10 per cent increase of wages to employees, effective Feb. 12. The monthly bonus plan of the company will also be continued.

A strike has been declared by 90 employees of the Portland Boiler Works and Columbia Engineering Works, both of Portland, Ore. Both are operating with decreased forces.

Starts New Steel Foundry in Phillipsburg

The Standard Process Steel Corporation, Phillipsburg, N. J., has taken over the plant formerly operated at that place by the Rowland Firth & Sons Company. It was incorporated in July, 1916, with a capital stock of \$300,000 and at that time Oscar L. Mills, Pittsburgh, was elected president and James L. Monahan, Phillipsburg, was made treasurer. At a meeting of the stockholders in January a new board of directors was elected. This board appointed the following executive committee: O. L. Mills, president; C. A. Russell, vice-president and W. P. Barba, one of the directors. Mr. Barba was formerly vice-president and general manager of the Midvale Steel Company.

The plant has just been put in operation and, with the completion within the next two weeks of an extension now being erected, will have a maximum output of 350 to 400 tons of steel and "process" steel castings per month. It will specialize in hardened steel gears, pinions, sprockets, spindles, coupling boxes and track wheels. The foundry contains a 10-ton open-hearth furnace. C. F. Riceman, formerly with Isaac Johnson & Co., Spuyten Duyvil, N. Y., is plant superintendent and J. J. Bisbing, formerly head melter of the Bethlehem Steel Company, will be in charge of melting.

The Harris Automatic Press Company will remove its plant from Niles to Cleveland, where it has built a new works. It manufactures printing presses.

PERSONAL

At a meeting of the new directors of the Wellman-Seaver-Morgan Company, Cleveland, Feb. 26, Edwin S. Church was elected president to succeed Willard N. Sawyer, who tendered his resignation because of poor health. Mr. Sawyer will not engage actively in business for the present, hoping that by giving up business cares he will recover his health, which has not been good since he suffered an attack of typhoid fever two years ago. Mr. Church is well known in the industrial field. He was for some time president of the McIntosh & Seymour Corporation, Auburn, N. Y., and he has recently been engaged in some special work in connection with the export trade. W. P. Cowell was re-elected secretary and treasurer. S. T. Wellman, chairman of the board, and S. H. Pitkin, first vice-president, will continue in those positions until their successors are elected.

Jay H. McElhinney of the engineering department of the Youngstown Sheet & Tube Company for the past three years has been made chief inspector of the plants of the company to succeed Paul C. Keugle, recently appointed general manager of the Buckeye Land Company. Mr. McElhinney was formerly with the United Engineering & Foundry Company of Pittsburgh.

W. W. Hall, for some years district sales manager of the Republic Iron & Steel Company in the Pittsburgh district, has resigned, and after about April 1 he will be connected with the Columbia Steel & Shafting Company, Carnegie, Pa. His successor has not yet been appointed.

Thomas Fawcett, president Fawcett Machine Company, Pittsburgh, maker of gears and pinions, is on a vacation at Pass Christian, Miss.

Frank M. Erb, formerly superintendent of production, R. D. Nuttall Company, manufacturers of gears and trolley line material, Pittsburgh, Pa., has severed his connection with that company and will open an office in the Second National Bank Building, Pittsburgh, about March 5, as a manufacturers' representative, and will handle castings and forgings.

T. Hart Given, president Farmers' Deposit National Bank, Pittsburgh, has been elected a director of the Crucible Steel Company of America to fill the vacancy in the board caused by the death of C. C. Ramsey.

William Ralph Webster has been promoted from chief draftsman to assistant chief engineer of the Cambria Steel Company, Johnstown, Pa.

H. K. Williams has been elected a director and vice-president of the Damascus Brake Beam Company, Cleveland. As director he succeeds E. W. Harden of New York, resigned. A. E. Adamson, who was assistant treasurer, has been elected treasurer in place of K. F. Gill, resigned.

John Airey, assistant professor of engineering mechanics at the University of Michigan, Ann Arbor, Mich., has been made inspector of munitions for the British Government, with headquarters at Chicago.

The Vulcan Steel Products Company, 120 Broadway, New York, states that Harold B. Schneider, manager of the company's metal department, is on a business mission in Scandinavia and Great Britain, and that M. V. Dreyspool, purchasing agent, is making a business trip to China, Japan and the Orient generally.

D. Walter Munn, of the Montreal Rolling Mills Branch of the Steel Company of Canada, has joined the engineering department of the Algoma Steel Corporation, Ltd., Sault Ste. Marie, Canada.

Frank F. Krause, general manager of the Weimer Chain & Iron Company, Lebanon, Pa., has been made secretary of the company.

Eric H. Peterson, mechanical and refrigerating engineer with the Ford Motor Company, Detroit, has been chief engineer with the Vogt Brothers Mfg. Company,

formerly the National Foundry & Machine Company, Louisville, Ky.

E. Carlson, for the past two and one-half years assistant superintendent of the Stewart Die Casting Company, has resigned to become chief engineer of the Indiana Die Casting Company, Indianapolis.

Frank Disston, president Henry Disston & Sons, Inc., Philadelphia, is the author of "How We Hold Our Men," in *System*, for February.

Frederick Perkins, president National Marine Lamp Company, Bristol, Conn., has tendered his resignation, which will be acted upon at a meeting this week.

Charles L. Allen, treasurer and general manager of the Norton Company, and Harry G. Stoddard, vice-president and general manager of the Wyman-Gordon Company, Worcester, Mass., have been appointed members of the subcommittee on industrial survey of the Massachusetts Committee of Public Safety.

Henry D. Sharpe, Brown & Sharpe Mfg. Company, Providence, R. I., has been chosen a director of the New England Telephone & Telegraph Company in recognition of the large stock interest held in Rhode Island.

Herbert M. Ramp, president Elmwood Castings Company, Elmwood Place, Cincinnati, has resigned to accept the position of works manager of the Bay View Foundry Company, Sandusky, Ohio, in which company he will be interested as a stockholder and director. Mr. Ramp is widely known as an expert foundryman and has been a frequent contributor to trade journals on general foundry practice.

At the recent annual meeting of the stockholders of the Massillon Rolling Mill Company, Massillon, Ohio, H. A. Taubensee, sales manager of the company, was elected a director to succeed J. M. Jones, formerly general manager, who has resigned from the board.

James L. Bruff, for many years connected with the Turner Construction Company as contracting agent in charge of the Buffalo district, has resigned from that position and become associated with the John W. Cowper Company, engineer and contractor, Buffalo, as second vice-president. His office will be with that company in the Fidelity Trust Building, Buffalo, hereafter.

T. L. Lewis, assistant manager of sales of A. M. Byers & Co., Inc., Pittsburgh, maker of wrought-iron pipe, has gone to the Pacific coast on a three months' business trip.

F. Lloyd Mark has been appointed Western sales manager, with offices at 728 Monadnock Building, Chicago, for the Stroh Steel-Hardening Process Company, Pittsburgh.

W. R. Colcord, who has been president of the Colcord-Wright Machinery Company, St. Louis, has been elected president of the Dorris Motor Car Company of that city, which has increased its capital from \$30,000 to \$1,000,000, and will retire from the presidency of the machinery company, but will retain his interest therein. That company will continue to be operated by his associates, A. Scheu, J. W. Wright, J. H. Bentzen and others, who have been with the company many years as stockholders and officers.

William H. Gessman, blast-furnace superintendent at the Gary plant of the United States Steel Corporation, has been appointed general superintendent of the open-hearth plant of the Brier Hill Steel Company, Youngstown, succeeding William H. Warren, who is now general manager.

A large number of employers of Bridgeport, Conn., and vicinity have organized the Employers' Association of Fairfield County along the lines of several similar organizations in New England. W. R. Bassick, Burns & Bassick Company, is president; H. H. Hamilton, Whiting Mfg. Company, first vice-president; R. E. Hurley, Casey & Hurley, second vice-president; Walter B. Lashar, American Chain Company, third vice-president; L. B. Powe, Connecticut National Bank, treasurer.

Atkinson & Utech, Inc., 111 Broadway, New York, have placed contracts for 7000 tons of high-grade alloy steel bars for export.

OBITUARY

E. S. CULLEN, of the Cullen Machinery Company, Cleveland, died Feb. 24 from pneumonia, after a two days' illness. He was widely known in the machinery trade, especially in the Central West, where he had traveled for about 40 years. For much of that time he had devoted special attention to the railroad trade. He was associated in the Cullen Machinery Company with his brother, C. W. Cullen. Another brother, James K., is president of the Niles-Bement-Pond Company.

SAMUEL L. WINTERNITZ, perhaps the most prominent auctioneer specializing in the purchase and sale of machinery and plants, died Feb. 23 at his home in Western Spring, Ill., a suburb of Chicago, at the age of 58. The exceptional confidence in which he had come to be held by the courts was an invaluable advantage in his negotiations for property disposed of at receivers' sales.

CLARENCE R. BROWN, manager of the Buchanan Foundry Company, Lebanon, Pa., died Feb. 20 after a week's illness from pneumonia, aged 31 years. He went to Lebanon from Philadelphia two years ago to succeed his brother, T. Harold Brown, in the management of the foundry in which the Brown family holds a controlling interest.

FREDERICK ROWLAND HAZARD, president Solvay Process Company, and a director in many large industrial corporations, died at Syracuse, Feb. 27. He was born at Peace Dale, R. I., in 1858, and was graduated from Brown University in 1881.

Meeting of the Taylor Society

The winter meeting of the Taylor Society will be held in Boston, March 2 and 3. Headquarters will be at the Engineers' Club. The Friday evening session will be held at Huntingdon Chambers, 30 Huntingdon Street and the remaining sessions at the Engineers' Club. The program is as follows:

Friday, March 2, 8 p. m.—"Maintenance of Machines and Equipment as Part of the Taylor System of Management," by H. K. Hathaway, vice-president Tabor Mfg. Company, Philadelphia.

Saturday, March 3, 8 a. m.—Visit to plant of Waltham Watch Company, Waltham, Mass. 2 p. m.—"The Tabor Beneficial Society," by Herman J. Hutkin and Nathaniel Johnson, Tabor Mfg. Company, Philadelphia. "The Manager, the Workman and the Social Scientist," by H. S. Person, president of the Society and director of the Amos Tuck School of Administration and Finance, Dartmouth College, Hanover, N. H. 6:30 p. m.—Dinner. 8 p. m.—Discussions of the papers of the afternoon session.

All of the sessions will be opened to guests, including ladies.

Steel Plant Proposed at Hamilton, Canada

The Carbon & Alloy Steels Company, Ltd., which has obtained a Dominion charter with an authorized capital of \$1,500,000, will erect furnaces and a foundry plant in Hamilton, Canada, for the manufacture of steel castings, ingots, etc., by the Moffat electric process. The company will also take over the Moffat-Irving Steel Works of Toronto, which will be moved to Hamilton and added to the new plant. Plans have been prepared by Prack & Perrine for buildings that will cost about \$100,000. The main building will be 60 x 400 ft., and subsidiary buildings will cover an equal area. Another \$200,000 will be spent in furnaces, electrical equipment, conveyors, cranes, compressors, and other machinery. The plant when fully equipped will have a gross capacity of 32 tons of molten steel per 24 hr. The incorporators are J. B. O'Brien, president Moffat-Irving Steel Works, Ltd., Toronto; H. J. Waddie, president Canadian Drawn Steel Company, Ltd., Hamilton; J. W. Moffat, vice-president Moffat-Irving Steel Works; John G. Gauld and W. E. Vallance, Hamilton.

NEW BETHLEHEM MILLS

New 18 and 12 In. Structural Mills, Saucon Plant, Bethlehem Steel Company

Pursuant to its policy of rounding out the structural steel business at Bethlehem, the Bethlehem Steel Company decided to build 18 and 12 in. mills to augment the structural shapes rolled on the Bethlehem shape mill and the 28-in. structural mill. After considerable investigation it was decided to install a three-high, 18-in., three-stand mill, equipped with traveling tilting tables, to roll medium sized structural shapes, such as angles, beams, channels, etc., in order to fill in and lap the smaller sizes of sections rolled on the 28-in. mill. To further round out this situation it was decided to install 16 and 12 in. trains, to roll the lighter sections of angles, beams, channels, rounds, flats, etc., within the scope of the mill, which consists of six 16-in. stands of roughing and four 12-in. stands of finishing rolls.

The two mills are housed in a building 155 ft. in width by 600 ft. in length, supplemented by a crane runway, 85 ft. span by 250 ft. long, for the handling of billets for the heating furnaces. The finishing end is commanded by a distributing covered crane runway, 84 ft. span and 500 ft. in length.

The 18-in. mill is served by two recuperative furnaces, with gravity discharge, using coke-oven gas as fuel. It is operated by a 1500-hp., three-phase, 25-cycle, 6600-volt motor with speed ratio, 133 to 81 1/2 r.p.m., and a 525-hp. 220-volt compound wound direct-current motor, with the same speed ratio, making a direct-current and alternating-current driving unit. The mill is backed up with a hot saw and double hot bed table equipped in duplicate with straighteners, shears, gages and scales to shear and handle the product as fast as rolled.

The 16 and 12 in. mill is equipped with a run-out table and cooling beds with center run-out, backed up with duplicate roller straighteners, shears, gages, weighing and bundling equipment. This mill is served by two 18 x 34-ft. continuous furnaces of the Morgan type, using coke-oven gas as fuel. The driving power is furnished by a 2000-hp. 6600-volt, 25-cycle alternating-current motor with a speed range of 65 to 100 r.p.m.

The 18-in. mill was started recently and the first bar rolled was merchantable product. The 12-in. mill will be ready for operation in several months. The entire mill equipment and auxiliaries are the best of their kind and the most modern in every respect. The buildings housing these mills are of brick and steel, of entirely fireproof construction, arranged to give the maximum ventilation and daylight.

With these mills in operation the Bethlehem plant will be enabled to roll sections ranging from the very lightest to the heaviest. The billets and blooms rolled on them are supplied by the existing blooming mills at the company's Saucon plant. The cost of these extensions and improvements will be in the neighborhood of \$2,500,000.

In line with the company's practice, these mills are to be equipped with first-class lavatory facilities, including shower baths, individual lockers, etc., for the comfort and benefit of the employees.

Proposed Tube Plant at Warren, Ohio

The International Steel Tube & Rolling Mills, Inc., plans to begin shortly the erection of a plant in Warren, Ohio, for the manufacture of iron and steel tubular goods, including lap-welded iron and steel boiler tubes and lap and butt welded pipe. The company has closed a deal with the Warren Board of Trade for a 25-acre tract along the line of the Baltimore & Ohio and Erie railroads. Four main buildings are contemplated from 80 to 100 ft. wide and from 300 to 500 ft. long. The plant will include puddling furnaces, skelp rolling mills, a tube-welding department and a finishing department. It is the intention to have the plant in operation by next fall. The company has a capital stock of \$2,500,000. H. K. Flagler, who has built a number of tube mills, is president and general manager, and C. H. Hopkins is treasurer. The company's main office is at 804 Citizens Building, Cleveland.

Pittsburgh and Nearby Districts

It is officially announced that the main offices of the Sharon Steel Hoop Company, which is taking over the Youngstown Iron & Steel Company, will remain in Sharon, Pa. The new company has not yet actually been named, but it will probably be known as the Sharon Steel Company. Several years ago the Sharon Steel Hoop Company erected a large office building in Sharon, and this will be used as the main offices for the new company. It is said that about 90 per cent of the stock of the Youngstown Iron & Steel Company has been placed in escrow, subject to the option of Severn P. Ker, president Sharon Steel Hoop Company, to purchase it at \$200 per share.

Steps are being taken to dissolve the Andrews & Hitchcock Iron Company, operating two blast furnaces at Hubbard, Ohio, and which was taken over some months ago by the Youngstown Sheet & Tube Company.

In reference to the purpose of the Witherow Steel Company, Pittsburgh, to increase its capital from \$400,000 to \$470,000, it is officially stated that the company does not intend to make any additions to its plant at present, the increase being made to provide more working capital.

General industrial conditions in the Youngstown district were never more prosperous than they have been for some months. Every manufacturing plant in the district is operating to full capacity. There are intimations that another large steel plant, with sheet mills and possibly tin-plate mills, will be built by parties now connected with the Youngstown Iron & Steel Company, and others, plans for which are already under way.

Work on the three 100-ton open-hearth furnaces under erection by the Youngstown Sheet & Tube Company is progressing rapidly. It is expected to have one ready for operation in April, another about May 1, and the last about June 1. The company is installing a 1300-ton metal mixer built by the Pennsylvania Engineering Works, New Castle, Pa., the steel building to house it being furnished by the Riter-Conley Company, Pittsburgh. A 9-in. mill, built by the Morgan Construction Company, Worcester, was recently completed and on it the Sheet & Tube Company has rolled some material for its own use, but so far none for the open market. On this mill wire rods can also be rolled. The company is also installing a 12-in. Morgan mill, which will be ready in April, on which merchant steel bars, small angles and channels—new products for this company—will be rolled. On the 9-in. mill a large quantity of 1½-in. skelp for making pipe 8/10 in. in diameter has been rolled.

The new 500-ton blast furnace of the Republic Iron & Steel Company under erection at Haselton, Ohio, is expected to be finished about May 1. This will give the company a total of five furnaces at Haselton, four of which will have a daily output of about 500 tons and the other about 400 tons. The company also operates Hannah furnace at Youngstown, Hall at Sharon, and Atlantic at New Castle, Pa., all of which are active.

The Pittsburgh Foundry & Machine Company, Pittsburgh, has filed notice of an increase in its capital stock from \$30,000 to \$100,000.

The Pittsburgh Tool Steel Wire Company, Monaca, Pa., will increase its capital from \$50,000 to \$250,000.

The Carnegie Steel Company, Pittsburgh, recently purchased five electric cranes, ranging from 10 to 25 tons capacity, from the Morgan Engineering Company, Alliance, Ohio. It plans to replace a great many machine tools in its various plants in the Pittsburgh district, and an appropriation for this new equipment is expected to be made in a short time.

The M. & D. Mfg. Company has started its new plant at Mosier, near Youngstown, Ohio, and will manufacture sad irons, electric irons and other metal specialties.

The Buckeye Land Company, just organized as a subsidiary of the Youngstown Sheet & Tube Company, will have charge of the development of about 300 acres on both sides of the Mahoning River at Youngstown, on which it is proposed to build 300 or more houses

for employees. Paul Keugle, formerly chief inspector of the Youngstown Sheet & Tube Company, has been made general manager of the Buckeye Land Company. It is stated that initial plans provide for the spending of close to \$500,000 in the building of homes, and this amount may be increased. The new company has a nominal capital of \$50,000. Its officers are the same as those of the Youngstown Sheet & Tube Company.

A controlling interest in the Pittsburgh Rivet Company, whose plant is located in the Lawrenceville district, Pittsburgh, has been purchased by R. W. Anderson, W. J. Reitz and M. A. Herald. Mr. Anderson has been elected president; Mr. Reitz, vice-president, and Mr. Herald, secretary, treasurer and general manager. The plant makes all kinds of boiler and structural rivets, forgings, bolts and heavy steel specialties. The new owners plan to make some improvements and extensions to capacity. Mr. Anderson was assistant to the late F. H. Eaton, president American Car & Foundry Company, and prior to that was with the Illinois Steel, Colorado Fuel and the Pittsburgh Steel companies. Mr. Reitz was district sales agent for the Pittsburgh Steel Company for some years, and Mr. Herald was in one of its operating departments.

The Hydraulic Gas Power Company, Youngstown, Ohio, has been organized with a capital of \$200,000 for the purpose of manufacturing pumping machinery. A special pump will be made under the Humphrey patents, and the product will be made in the plant of the William Tod Company. A. P. Steckel and F. D. Thompson of the Tod Company are the inventors of the new pump. They are among the incorporators as are John T. Harrington, C. H. Booth and U. C. DeFord.

The city of Alliance, Ohio, has given a contract for a new pumping station to the Pitt Construction Company, Pittsburgh, and contract for cast-iron pipe and specials to the United States Cast Iron Pipe & Foundry Company.

A contract for water-tube boilers for the main pumping station of the Tri-Cities Water Company, Charleroi, Pa., has been awarded to the Heine Boiler Company, Phoenixville, Pa. This work is under the supervision of Chester & Fleming, engineers, Pittsburgh, Pa.

The General Slag Products Company, Youngstown, with a capital of \$100,000, has been formed by Youngstown and Cleveland interests. It will engage in the reduction of blast-furnace slag for various commercial uses.

Reports are current that a new sheet-mill plant with six hot mills will be erected between Niles and Warren, Ohio. Cleveland and Boston parties are said to be connected with the new project and it is stated that later an open-hearth steel plant and possibly a blast furnace may be added. It is said that none of the interested parties has any connection with the Youngstown Iron & Steel Company.

A decision of importance to steel industries and railroads in the Pittsburgh district was rendered by the Public Service Commission, Harrisburg, Pa., on Monday, Feb. 26, when it denied the right of the railroads to charge pig-iron and steel manufacturers 20c. per ton for the transportation of slag. For 40 years the roads carrying iron, coal and limestone to the plants had removed the slag without charge, but two years ago they fixed the rate named above and manufacturers appealed to the commission.

The Railway Tie Corporation, with offices in Chicago and Philadelphia, has taken an option on a site in the southern part of St. Louis for the establishment of a rolling mill. It will at first equip a plant capable of employing about 300 men and later enlarge its capacity. The site chosen has both water and rail transportation facilities. The corporation, which has been dealing in patented metallic railroad ties and has the right to the manufacture of an automatic railroad switch, will also manufacture bar iron, angles, beams, rods, tie-plates and other rolled products. J. Alvin Hyle, Chicago, acted for the company in the transaction.

Pacific Coast Export Rates Raised

WASHINGTON, Feb. 27.—The Interstate Commerce Commission has vacated the order suspending schedules filed by the transcontinental roads effective October, 1916 proposing to increase their rates on iron and steel from Chicago, Pittsburgh and other points to Pacific coast terminals for export. Upon protest by the United States Steel Products Company, Inland Steel Company, Manufacturers' Association of Illinois, and other manufacturers and shippers, these schedules were suspended until Jan. 29, 1917, and later until July 29, 1917.

Of the rates named in the suspended schedules, the protests relate almost entirely to structural material destined to Japan, China and Manila. The present export rates to the Pacific coast ports are, from Chicago 30c. per 100 lb. and from Pittsburgh, 42c., which result from the effort of the railroads to meet the competition by rail and water from Pittsburgh via the port of New York. It was proposed in the schedules under suspension to increase the rate from Chicago to 40c. and the rate from Pittsburgh to 45c. Upon consideration of all the facts in the record the commission expresses the opinion that the proposed increased rates have been justified and therefore vacates the order of suspension. The new rates, which will be effective April 2, will be approximately 12c. higher per 100 lb. than the rates by way of New York. "The quicker service, reduced war risks and lower insurance rates," reads the commission's decision, "tend, however, to equalize the rate disadvantage. Chicago, with the proposed rate of 40c., would get a through rate to the Orient via the Pacific coast ports of 130c., or 5c. less than Pittsburgh would pay via the Pacific coast ports."

W. L. C.

Hamilton, Ohio, Blast Furnace Sold

The furnace at Hamilton, Ohio, owned by the Miami Iron & Steel Company, which has been idle for about three years, has been sold to new interests composed of H. W. Croft, president Harbison-Walker Refractories Company, Pittsburgh; J. A. Savage, who has been superintendent of two ore mines in the Cuyuna range, Minnesota, owned by Mr. Croft; an attorney of New York City, W. A. Chadbourne; L. C. Turley, Portsmouth, Ohio, a director of the Harbison-Walker Company and director of its Portsmouth district. The furnace has a daily capacity of about 350 tons. It is understood that the new owners will put it in blast at an early date on foundry iron. A considerable stock of foundry ores is on hand, and after these have been worked up the furnace will go on Bessemer. There are 80 acres of ground included in the sale and there is some talk of building an open-hearth steel plant later.

A by-product coke plant is situated across the railroad tracks from the furnace, having 100 Otto-Hoffmann ovens, owned by the Hamilton Otto Coke Company, but it is not included in the sale. Its output of coke is under contract to July 1, but after that date it is possible the coke will be used in the Hamilton furnace, although no arrangement to this effect has yet been made.

New Blast Furnace at Pittsburgh

The Jones & Laughlin Steel Company has started the erection of a new 500-ton blast furnace to be known as Eliza No. 6, at its Pittsburgh works. It is said a strong attempt will be made to build this furnace in 120 days from the time work starts, and it will be erected largely by the company itself. The Treadwell Construction Company will furnish two stoves, and the Otis Elevator Company the skip-hoist. The Jones & Laughlin Steel Company, when this new furnace is completed, will have a total of 11 stacks with a combined daily capacity of close to 5500 tons. It is building more open-hearth furnaces at its Soho works to provide steel for the new plate mill now being installed, and it is quite likely that even after the new Eliza blast furnace is finished, the company will still be a buyer of pig iron in the open market at intervals.

THE ENGINEERING COUNCIL

Organization of Engineering Societies to Act on Matters of Public Concern

The Engineering Council has been organized as a clearing house for the engineering profession whereby questions of general interest may be properly considered and a means provided for united action upon matters of concern common to engineers and the public. The Council will be a department of the United Engineering Society, 29 West Thirty-ninth Street, New York, and will be participated in by not only the founding societies of the United Engineering Society but all other leading engineering societies. Participation will be by representatives like the States in our Union, so that all societies will thus preserve their prerogatives, entities and freedom for individual action.

Each of the societies will be represented by one or more delegates according to its size and, unless objection is made by some of the member societies, the Council shall speak for the societies collectively on public questions. When there is objection the matter shall be referred to the governing bodies of the societies whose representatives protested. The Council will meet in various places and in this way establish a national atmosphere.

Dr. Ira N. Hollis, president American Society of Mechanical Engineers; H. W. Buck, president American Institute of Electrical Engineers, and Charles F. Rand, president United Engineering Society.

We, the presidents of the national societies of Civil, Mining, Mechanical, and Electrical Engineers, and of United Engineering Society, with a membership of 30,000, cordially unite in supporting Congress and the Administration in the stand for freedom and safety on the seas, and we are confident that we represent the membership of the four societies in offering to assist toward the organization of engineers for service to our country in case of war.

The telegram was signed by George H. Pegram, president American Society of Civil Engineers; L. D. Ricketts, president American Institute of Mining Engineers; Ira N. Hollis, president American Society of Mechanical Engineers; H. W. Buck, president American Institute of Electrical Engineers, and Charles F. Rand, president United Engineering Society.

Merger of Publishers of Engineering Journals

The McGraw Publishing Company, Inc., and the Hill Publishing Company, both publishers of engineering journals, have consolidated as the McGraw-Hill Publishing Company, Inc. The new company acquires all the properties and interests of the two constituents, including, *Electrical World*, *Electrical Merchandising*, *Electric Railway Journal*, *Engineering Record*, *The Contractor*, *Metallurgical and Chemical Engineering*, *American Machinist*, *Power*, *Engineering News*, *Engineering and Mining Journal*, and *Coal Age*.

Two of these papers, the *Engineering News* and the *Engineering Record*, will be consolidated as the *Engineering News-Record*, with Charles Whiting Baker, now editor of *Engineering News*, as editor. Officers of the new company are: President, James H. McGraw; vice-president and treasurer, Arthur J. Baldwin, who succeeded the late John Hill as president of the Hill Publishing Company; vice-president and general manager, E. J. Mehren, formerly editor of *Engineering Record*.

The W. S. Barstow Management Association, 50 Pine Street, New York, has been incorporated to supervise the management of all public-utility properties controlled by the General Gas & Electric Company, the Eastern Power & Light Corporation and W. S. Barstow & Co., Inc. E. L. West has been elected president.

Machinery Markets and News of the Works

BIG LIST FOR ESSINGTON

New Plant to Build Steam Turbines, Etc.

Railroad Situation Easier—Machine-Tool Builder Again Advances Price and Others May Follow—Resale Offerings in Cleveland

One of the largest lists which has come before the machine-tool trade in years is that of the Westinghouse Electric & Mfg. Company for its new plant at Essington, Pa., a condensation of which will be found in the New York market. As noted, it follows huge buying by the General Electric Company. Incidentally, the latter company is to build a factory in Philadelphia.

The demand in Chicago continues heavy for all types of machines, also for small tools, such as taps, drill, dies, etc. A Western manufacturer has distributed orders for drilling machines amounting to \$1,250,000.

The tone of the market is good everywhere, with deliveries showing little evidence of becoming easier. The maker of a standard milling machine has not only advanced his price 10 per cent, but reserves the right to impose another advance of 10 per cent at the time of delivery.

Second-hand machines continue to come on the market, but their appearance is not causing any great apprehension on the part of manufacturers. In Cleveland three firms have finished their munitions contracts and are offering about 500 tools, mostly lathes, in the hope that they may benefit from the high prices now quoted for new machines. Cincinnati expects further advances in machine-tool prices because of the high cost of castings and machine parts.

The freight situation is better in Detroit and elsewhere, although on the Pacific coast shipyards are in distress from want of material.

New York

NEW YORK, Feb. 28, 1917.

On the heels of buying running into the hundreds of thousands of dollars by the General Electric Company, come the large requirements of the Westinghouse Electric & Mfg. Company for its new plant at Essington, Pa. Contracts for a portion of the plant involving about 8000 tons of structural steel, already have been let. While the initial enterprise will be large, the company owns a great deal more land than will be developed at once. At the outset no electrical products will be manufactured at Essington, the output being confined to steam turbines, condensers and other products now made by the Westinghouse Machine Company. The latter was formerly a separate entity as a company, but has been acquired by the Westinghouse Electric & Mfg. Company. The location of the new plant is in the center of the Delaware River shipbuilding industry, and the company will be in an excellent position to do its share in caring for the prospective demand for turbines to propel ships.

It is understood that as yet no orders have been placed for the equipment, but inquiries are in the hands of the trade. A condensation of the list follows:

Essington Plant Requirements

One horizontal boring, drilling and milling machine, 9-ft. post, 22-ft. bed.

Two 7-in. bar floor boring mills, 12-ft. post, 26-ft. bed.
Two 5-in. bar floor boring mills, 9-ft. post, 12-ft. bed.
One 4-in. bar floor boring mill, 9-ft. post, 12-ft. bed.
Six 3-in. or 4-in. precision mills, with vertical adjustment to spindle head.
One 3½-in. precision mill.
Two 3-in. precision mills.
One horizontal boring, drilling and milling machine.
Three 14-in. x 6-ft. lathes, with taper attachments.
Two 16-in. x 6-ft. lathes, with taper attachments.
Ten 16-in. x 8-ft. lathes.
Six 18-in. x 8-ft. lathes, with taper attachments.
One 18-in. x 20-ft. lathe.
Two 20-in. x 10-ft. lathes.
Fifteen 24-in. x 12-ft. lathes.
One 36-in. x 12-ft. lathe.
Three 7-in. shaping machines.
Two 16-in. shaping machines.
Two 28-in. shaping machines.
Three No. 1 universal milling machines.
Two No. 3 universal milling machines.
Three No. 2 milling machines.
Three 20-in. upright drilling machines, with sliding heads.
Two bolt pointing machines.
Fifty-five electric cranes, 3 to 100 tons, spans up to 100 ft.
Two 72-in. x 20-in. hobbing machines.
Four 36-in. x 14-in. gear cutting machines.
Two 24-in. bevel-gear planing machines.
Two 48-in. x 10-in. automatic gear cutting machines.
Two 8-in. machine shop lathes.
One 3-ft. radial drilling machine.
One 12-in. shaping machine.
One shearing machine.
Two 12-in. slotting machines.
One 50-in. boring mill.
Two 30-ft., three 16-ft., three 10-ft., one 8-ft., two 6-ft., two 5-ft. and two 4-ft. vertical boring and turning mills.
Three No. 5 plain milling machines.
Three No. 4 milling machines.
Four No. 4 universal milling machines.
Two No. 3 plain milling machines.
Two vertical routing machines.
Two cutter grinding machines.
One 1-in. bolt heading machine.
One 2-in. bolt heading machine.
Twenty-five planing machines of various sizes, equipped with 4 heads.
Twenty-eight lathes, ranging from 16 to 84 in.

The Singer Mfg. Company, Elizabeth, N. J., has placed with the Cleveland Automatic Machine Company, Cleveland, Ohio, the order for 500 or more machines, to which reference was made a week ago. Not only is the value of the order considerably over \$500,000, but it is understood that the Singer Mfg. Company wants more machines of the same kind. They are to be used in fuse work. It is not long since the Elizabeth company placed an order for several hundred hand screw machines for export to England.

Miscellaneous inquiries are numerous, and a fair business is being done, but more or less hesitancy is noted in some directions. A few inquiries have come from the New York Central Railroad. The shipyards are doing some occasional buying, and inquiring for punches and shears, the delivery of which is 7 to 8 months away. Dealers have made some sales for shipment to France and Spain despite the troubled export situation.

The builder of a standard milling machine has again advanced prices. They are up 10 per cent, with the option of asking 10 per cent more at the time of delivery. In the past two years this maker has advanced his prices about 60 per cent.

The El Paso Foundry & Machine Company, El Paso, Tex., is seeking a manufacturer who can supply a roller thrust bearing, approximately 18 in. in diameter, with one side ball and socket for alignment adjustment.

The Acme Steel & Malleable Iron Works, Inc., Buffalo, N. Y., has increased its capital stock from \$100,000 to \$400,000, all paid in. The controlling interest in the corporation has been relinquished by Edward G. Felthousen, who has been president for many years. D. J. Carson, formerly manager of the American Malleable Company, Lancaster, N. Y., has been elected president in his place. D. W. Roper is vice-president; C. J. Brandt and F. J. Hiser have

been re-elected secretary and treasurer respectively. The new directors are W. H. Andrews, E. K. Hyde, Darcy W. Roper, William H. Hill, E. G. Felthousen, Edwin T. Miller and D. J. Carson. The company is confining its output to the manufacture of high-grade malleable iron and ductile steel castings used chiefly in automobile construction. It has at present about one year's business on hand and materials have been contracted for to carry it through the greater part of this year.

The Rome Hollow Wire & Tube Company, manufacturer of seamless brass and copper tubes, Rome, N. Y., has increased its capital stock from \$100,000 to \$200,000 to provide for an expansion of its present business. F. J. De Bisschop is president and general manager; J. A. Spargo is vice-president, and F. M. Shelley is secretary and treasurer.

The Dyneto Electric Corporation was recently incorporated with a capital stock of 5000 shares of \$100 each and 15,000 shares of no par value to carry on business with \$575,000 and to take over the Dyneto Electric Company of Syracuse, N. Y., manufacturer of small electric apparatus, such as small motors and generators under 1 hp., also automobile electric starting and lighting systems and isolated lighting plants. The business is rapidly increasing and although the company has doubled its plant three times within the last year, it is again doubling it and is running a night shift. About 500 men and 250 women are now employed. In connection with the refinancing of the company, the following officers and directors have been elected: C. L. Amos, president; A. E. Doman, vice-president; Alexander M. Hall, 2nd, of the Liberty National Bank, second vice-president; John C. Boland, secretary, and J. D. Stemmler, treasurer. The directors are Jacob Amos, Carleton A. Chase and W. W. Ward of the John Deere Plow Company, Alexander M. Hall, 2nd, J. A. Bower of Hale & Kilburn, Philadelphia, George Timmins of the National Tube Company, and Dr. John A. Mathews, president and general manager of the Halcomb Steel Company.

The Linde Air Products Company, New York, at its recent annual meeting authorized an increase in its common stock from \$8,000,000 to \$15,000,000, which will be offered to stockholders of record March 5 at par to the amount of 30 per cent pro rata. The addition is intended to provide funds for expanding its business, building additional plants and supplying equipment.

B. B. Hoppe & Co., Moscow, Russia, are establishing a department for the sale of motors, cable, incandescent lamps and electrical accessories. They advise that they are in touch with large manufacturers of all kinds in Russia and have facilities to forward the sale of electrical merchandise. Communications should specify all details of design, price, weight, and particularly freight charges, which in many cases cannot well be calculated at present in Russia, as well as all allowances for breakage, etc.

The Century Pump Company, manufacturer of hand and power driven rotary pumps and special machinery and general machinist, 428-434 Third Avenue, Brooklyn, N. Y., has had plans drawn by Boyle & Prowler, 367 Fulton Street, Brooklyn, for the erection of a one-story brick factory, 73 x 80 ft., on the east side of Sixth Avenue, to provide larger quarters for the development of its present lines of business. H. Jackson is president.

The Automatic Ticket Selling & Cash Register Company, 1737 Broadway, New York, has increased its capital stock from \$100,000 to \$150,000 to provide for an expansion of its business.

Recent increases in capital stock reported by the Secretary of State, Albany, N. Y., are as follows: The Ferguson Iron & Steel Company, Buffalo, \$300,000 to \$800,000; the Standard Plumbing Supply Company, St. Ann's Avenue and 159th Street, New York, \$30,000 to \$150,000; the Half Moon Light, Heat & Power Company, Mechanicsville, N. Y., \$75,000 to \$150,000, for the expansion of its business, and the Mohawk Valley Heating Company, Utica, N. Y., \$6,000 to \$12,000.

The Lea-Courtenay Company, 5 Main Street, Newark, N. J., is in the market for a centrifugal oil separator equivalent to No. 2 American Tool & Machine Company type, a plain grinding machine, 72-in. centers and a large disk grinder.

The Dubilier Condenser Company, 81 New Street, New York, has established a plant for the manufacture of transmitting and protective condensers. John Firth is president.

The new plant which the Egyptian Lacquer Mfg. Company, 152 Front Street, New York, is erecting at Kearny, N. J., is in addition to its plant at Rahway, N. J. This plant was not destroyed by fire, as stated in THE IRON AGE of Feb. 8, but suffered merely a nominal loss, and has been now running quite normally for some time.

The Interborough Rapid Transit Company, 165 Broadway, New York, has made application to the Public Service Com-

mission for permission to issue bonds for \$16,436,000, bearing 5 per cent, for extensions and improvements. The proposed work includes the following: For alterations and additions in power plants used for the system, \$2,391,000; for extensions and equipment, \$2,533,000, and for third-track installation and equipment, \$10,444,000.

The R. Neumann Hardware Company, 9 St. Francis Street, Newark, N. J., manufacturer of hardware for trunks and bags, has had plans prepared for two four-story brick additions, 52 x 110 ft. and 82 x 136 ft., to be erected at St. Francis, East Ferry and Maine streets, at a cost of about \$100,000.

The A. W. Wheaton Brass Works, 157 New Jersey Railroad Avenue, Newark, N. J., operating a plant for the manufacture of builders' hardware, has filed articles of incorporation with a capital of \$40,000. Abram W., Sr., Abram W., Jr., and Walter Wheaton are the incorporators.

In connection with extensive improvements to be made by the Board of Works, Newark, N. J., at Port Newark Terminal, estimated to cost \$500,000, it is planned to build a roundhouse and construction shop buildings near Anchor Street. Morris R. Sherrerd is chief engineer.

The Blackburn Toy Mfg. Company, Newark, N. J., recently incorporated, has leased property at 119 Sussex Street for a manufacturing plant.

The Mineral Point Zinc Company, Newark, N. J., has filed notice of increase in its capital from \$400,000 to \$5,000,000, for extensions. Thomas B. Jones is president.

The International Ticket Company, Providence, R. I., operating a plant at Hoboken, N. J., in the name of the Rockwell Printing Company, 1112 Clinton Street, has acquired property at Oraton Street and Grafton Avenue, Newark, N. J., for the erection of a new manufacturing plant. Plans have been made and contract awarded for the erection of a one-story brick structure, 100 x 200 ft. Charles Manshel is president and general manager, and C. L. Rockwell, vice-president.

G. Steinhardt, Inc., 201 McWhorter Street, Newark, N. J., manufacturer of leather, has filed articles of incorporation with capital of \$150,000. Gustav, Ralph G. and L. J. Steinhardt are the incorporators.

The C. Pardee Works, Market Street, Perth Amboy, N. J., manufacturer of steel billets and bars, will build a one-story addition to its plant, 39 x 100 ft., to cost \$7,500.

The American Smelting & Refining Company, 129 Broadway, New York, copper and lead refining, etc., will build a one-story, concrete addition to its plant at Maurer, N. J., 54 x 97 ft. The company is taking bids for a new refinery at El Paso, Tex.

The Standard Shipbuilding Corporation, 44 Whitehall Street, New York, has filed plans for a new boiler and plate shop at its plant on Shooter's Island, Staten Island, to cost \$250,000.

The Penn Steel & Iron Corporation, Millbrook, N. Y., has been incorporated with a capital of \$155,000. A. E. Moore, 20 Arden Street, New York; F. H. Butchorn, 764 St. Johns Place, Brooklyn, and G. F. Jebbett, 120 Sherman Avenue, New York, are the incorporators.

The Pond Tool Works Company, Plainfield, N. J., is reported to have purchased the Burke property adjoining its plant on South Second Street.

The Singer Sewing Machine Company, Elizabethport, N. J., has awarded contract to the Austin Company, Cleveland, Ohio, for a one-story brick and steel foundry, 150 x 200 ft.

The Cayuga Tool Steel Company, Auburn, N. Y., has let contract for the erection of a steel manufacturing plant.

The Delaware & Hudson Railroad Company will erect a separator building, 42 x 158 ft., at Lyon Mountain, N. Y.

The Bossert Corporation, Utica, will build a power plant to cost \$50,000.

The Rockwood Mfg. Company, Rockwood, N. Y., has completed plans for a power plant estimated to cost \$300,000. Donald W. Hyde is president.

The Friendship Lighting Corporation, Friendship, N. Y., has been incorporated to manufacture electricity by M. R. and P. V. Lawrence, 27 Montgomery Place, Brooklyn, and T. J. Whalen, 60 Broadway, New York. The capital stock is \$50,000.

Witherbee, Sherman & Co., Port Henry, N. Y., will erect and equip three "clean-up" ore-concentrating buildings, 80 x 400 ft., at Mineville, N. Y.

The Jamestown Auto Parts Company, Jamestown, N. Y., is letting contracts for the erection of a factory, 80 x 200 ft., two stories.

The Lehigh Valley Railroad Company will erect a round-

house at East Buffalo, 13 x 28 x 200 ft., from plans of Westinghouse, Church, Kerr & Co., 37 Wall Street, New York.

The Camillus Cutlery Company, Camillus, N. Y., will erect a three-story factory of reinforced concrete.

The Rudolph Wurlitzer Mfg. Company, manufacturer of musical instruments, Tonawanda, N. Y., has let contract to the Turner Construction Company, Buffalo, for the erection of three factory buildings, 61 x 157 ft., three stories; 90 x 164 ft., one story, and 40 x 100 ft., one story.

Philadelphia

PHILADELPHIA, PA., Feb. 26, 1917.

The General Electric Company, Schenectady, N. Y., has purchased property at Seventh and Willow streets, Philadelphia, Pa., on which it is now erecting a six-story and basement reinforced concrete factory containing 125,000 sq. ft. of floorspace to be used as a switchboard factory. C. G. Hulth is superintendent of grounds and buildings.

The John A. Roebling's Sons Company, South Broad and Canal streets, Trenton, N. J., is about to begin the erection of a one and three-story building, 95 x 594 ft., estimated to cost \$135,000.

The Chief of the Bureau of Yards and Docks, Navy Department, Washington, is receiving proposals for the construction of a one and one-half story machine and electric shop, 150 x 500 ft., at the navy yard, Philadelphia, at a cost of \$500,000.

The Sweet Steel Company, Williamsport, Pa., manufacturer of reinforcing bars, has started the construction of a one-story machine shop, 40 x 150 ft.

The Reading Engineering Works, Reading, Pa., will purchase a 70 to 100-kw. generator set, steam engine driven, for a three-phase 60-cycle alternating current.

The American Engineering Company, Aramingo Avenue and Cumberland Street, Philadelphia, manufacturer of iron and steel castings, machinery parts, etc., has acquired a tract of 22 acres at Wheatsheaf Lane and Amber Street as a site for a new plant. Contract has been awarded for the erection of a one-story, brick and steel building, 200 x 300 ft., at the new location. The Austin Company, Cleveland, is the contractor.

The Hess-Bright Mfg. Company, Front Street and Erie Avenue, Philadelphia, manufacturer of bearings, pulleys and hangers, will take bids March 5 for the erection of a one and two-story brick and steel addition, 80 x 200 ft., at Erie Avenue and Second Street.

F. R. Hansell, Philadelphia, Pa., has incorporated in Delaware the William H. King Company, to manufacture iron and steel goods. Other incorporators are George H. B. Martin and S. C. Seymour, Camden, N. J.

The Philadelphia Electric Company, Philadelphia, has increased its capital stock from \$25,000,000 to \$50,000,000, to provide for proposed extensions in its electric power plants and system.

The Quaker City Iron Works, Salmon and Tioga streets, Philadelphia, has filed plans for a one-story machine shop, 50 x 60 ft.

The Philadelphia & Reading Railroad is planning to electrify its system from Pottsville to Schuylkill Haven, Pa., and later to Reading, a total distance of 37 miles. The work, including equipment, is estimated to cost \$750,000.

The Lancaster Sheet Metal & Supply Company, North Mulberry Street, Lancaster, Pa., will build a brick addition to its plant, 30 x 240 ft.

Fire Feb. 21 caused a loss of about \$8,000 at the garage of Edward A. Lilly and shop of the North Penn Machine Company, Twenty-seventh and Sergeant streets, Philadelphia.

Ketcham & McQuade, 1029 Brown Street, Philadelphia, have submitted the low bid for the erection of a steel and concrete artillery case shop at the Frankford Arsenal at a cost of \$55,000.

The tool building and carpenter shop at the Port Richmond, Philadelphia, freight yards of the Philadelphia & Reading Railroad were destroyed by fire Feb. 9 with loss estimated at \$20,000.

The Sun Shipbuilding Company, Chester, Pa., has had plans prepared for two one-story, brick and concrete additions to its plant. Bids are now being received.

The Western Electric Company, Chicago, is reported to be negotiating for the purchase of a site at Essington, Pa., for a large branch plant. The proposed site is in the district of the new Westinghouse Electric & Mfg. Company plant, soon to be erected.

New England

BOSTON, MASS., Feb. 26, 1917.

The Walco Mfg. Corporation, Providence, R. I., has closed down its shop and paid off its 1500 employees. The contract for 5,710,000 fuses has been completed in record time. Nearly all of the men sent to Providence by the Westinghouse Company will be transferred to other factories of that corporation. C. H. Smith, manager, will go to Pittsburgh; H. M. Wood, assistant manager, will become assistant manager of the International Arms & Fuse Company, Bloomfield, N. J.

The General Electric Company has sold its plant in Great Barrington, Mass., to William H. Walker. The plant will be used for the manufacture of a bottle of the thermos type which was invented by the late William Stanley. The plant includes a large tract of land, a two-story brick building and several small wooden buildings, which together comprise 30,000 sq. ft. of floor space.

The Heald Machine Company, Worcester, Mass., has voted to increase its capital stock from \$100,000 to \$250,000. An additional 15,000 shares will be taken from the surplus, which amounts to \$600,000, and will be distributed pro rata among the stockholders.

The New Britain Machine Company, New Britain, Conn., has had plans drawn for a two-story addition to its factory on Chestnut Street. The office will be located on the top floor of the new addition.

The Maxim Munitions Corporation, New York City and Derby, Conn., will hold a special meeting of stockholders March 5 to vote upon the proposal to issue \$500,000 bonds to be secured by a mortgage on the land and buildings of the company.

The Stanley Rule & Level Company, New Britain, Conn., has asked from the legislature the right to increase its capital stock from \$2,000,000 to \$10,000,000.

The Stanley Works, New Britain, Conn., has awarded a contract for an eight-story warehouse on Myrtle Street.

The Royal Typewriter Company, Hartford, Conn., will build three buildings similar in material and design to those now occupied by the company. The new buildings will increase the size of the plant by more than 60 per cent and will permit the employment of 1000 additional workmen. One building will be 50 x 310 ft., four stories; another, 50 x 150 ft., four stories; and the third, 50 x 310 ft., two stories, and an extra story will be added to the present one-story building.

The National Machine Company, Hartford, Conn., has voted to increase its capital stock from \$60,000 to \$100,000. S. M. Wetherley, president, and the other officers were re-elected.

The Wallace-Barnes Company, Bristol, Conn., has filed a certificate of increase in capital stock from \$30,000 to \$510,000.

The Snell Mfg. Company, Sturbridge, Mass., will build a forge shop, 40 x 90 ft., one story, to replace that recently burned.

The J. T. Slocumb Company, Boston, Mass., has been incorporated with a capital stock of \$500,000 to deal in iron, steel, lumber, etc. The directors are James Drury, president; Clifford L. Lyall, 33 State Street, Boston, treasurer; and William D. McSkimmon.

The Tayco Roller Bearing Company, Providence, R. I., has been incorporated with a capital stock of \$500,000 by Ralph M. Greenlaw, Charles E. Tilley and Edwin J. Tetlow, all of Providence.

The Goodell-Pratt Company, Greenfield, Mass., is having plans drawn for an addition to its machine shop, four stories, to contain 22,000 sq. ft.

The Jacob & Kugler Foundry Company has purchased land on East Street, Easthampton, Mass., and will erect a foundry, 60 x 60 ft. Paul M. Kugler, Easthampton, and Albert Jacob, Rochester, are active in the company.

G. Haarmann & Co., Inc., Holyoke, Mass., has purchased additional land and is planning to build an addition this spring.

The Continental Wood Screw Company, New Bedford, Mass., has awarded a contract for a factory, 40 x 260 ft., two stories, and boiler house, 28 x 30 ft.

The committee on incorporations of the State Senate of Connecticut has reported favorably on a bill permitting the Colt's Patent Fire Arms Mfg. Company, Hartford, Conn., to increase its capital stock from \$5,000,000 to \$10,000,000.

The B. C. Ames Company, Waltham, Mass., has awarded a contract for an addition, 30 x 100 ft., three stories.

The General Electric Company, Lynn, Mass., has awarded a contract for a factory building, 210 x 400 ft., one and three stories.

The D. E. Whiton Machine Company, Oak Street, New London, Conn., will begin soon the erection of an addition, 150 x 200 ft.

The Harding Mfg. Company, Mansfield, Mass., machinist, suffered the total loss of its plant by fire Feb. 13.

Baltimore

BALTIMORE, Md., Feb. 26, 1917.

The Porcelain Enamel & Mfg. Company, Public Service Building, Baltimore, has been incorporated with \$1,500,000 capital stock to manufacture stamped or enameled products. The incorporators are William A. Zimmerman, W. Graham Boyce and Walter H. Buck. John L. Bailey, an official of the Consolidated Gas, Electric Light & Power Company, will be the resident agent. The company will take over the Maryland Enamel & Sign Company, O'Donnell and Eighth streets, Highlandtown, Md. It plans to greatly enlarge the plant. The directors are to be J. M. Jones of the Bethlehem Steel Company; John M. Dennis, president of the Union Trust Company; E. S. Dickey of the Maryland Meter Company; Herbert A. Wagner, president of the Consolidated Gas Company; Harry W. Hunter, president of the Gas Appliance Company; John L. Bailey, treasurer of the Consolidated Gas Company, and Heinrich Turk, now one of the officials of the Maryland Enamel & Sign Company. Mr. Bailey will be chairman of the board; Mr. Turk will be president, Karl Turk will be vice-president, and W. Graham Boyce will be secretary and treasurer.

The Western Maryland Railway Company, Baltimore, has purchased a 40-acre tract at Ridgely, near Cumberland, Md., and is understood to be planning to use the property for additional trackage and shops.

The Cathedral Bell Mfg. Company, 1101 Cathedral Street, Baltimore, has been incorporated with \$10,000 capital stock.

The American Belting Companies, Texas, Md., has been incorporated with \$25,000 capital stock to manufacture belting, etc. The incorporators are Daniel Bresman, James T. Miller and Charles C. Eichner.

Chicago

CHICAGO, ILL., Feb. 26, 1917.

Despite the retarding handicaps of railroad congestion, orders for machinery equipment and machine tools are practically undiminished. This is true also of export and domestic sales. One large dealer reports that last week was one of the greatest in volume of business it has had and that nearly 60 per cent of the sales was for export. Extensions of metal-working plants represent an unparalleled increase in capacity and marked expansion is noted in facilities for the manufacture of steel and malleable iron castings, with its attendant demand for foundry equipment. Sales of small tools, drills, taps, dies, etc., are maintained in unprecedented volume. A Western manufacturer recently divided among several makers an order for drilling machines amounting to \$1,200,000. Crane builders, trolley and hoist manufacturers also report a demand greatly in excess of their capacity on the basis of any reasonably prompt delivery.

Frank D. Chase, architect, 122 South Michigan Avenue, Chicago, is preparing plans and letting contracts for the new malleable iron foundry of the Saginaw Malleable Iron Company, Saginaw, Mich., and the gray and malleable iron foundry for the Gilliam Mfg. Company, Canton, Ohio. The former plant involves an expenditure of \$175,000, the latter \$150,000.

The Fruin Drop Forge Company, 347 Root Street, Chicago, is having plans prepared for an addition to its plant.

The Standard Artificial Ice Company, 3542 North Lincoln Street, Chicago, has placed the contract for a new plant to cost \$25,000.

The Seipp Realty Trustees, 179 West Washington Street, Chicago, will build a one-story machine shop, 58 x 182 ft., to cost \$15,000.

The Goodman Mfg. Company, South Halsted Street, Chicago, manufacturer of mining equipment, has awarded the contracts for additions to its plant.

A. S. Baldwin, engineer, Illinois Central Railroad, Chicago, is preparing plans for a shop and roundhouse at Palestine, Ill., to cost \$100,000.

The Chicago & Northwestern Railroad is preparing plans for additions to its Chicago shops, to include three buildings, 50 x 200 ft., 58 x 200 ft., and 180 x 208 ft.

Cerny, Pickas & Co., operating architectural iron works, 2700 South Crawford Avenue, Chicago, are preparing to erect an addition, 99 x 145 ft., to cost \$26,000.

The Ryan Fuel Saver Company, Chicago, has been incorporated with a capital of \$10,000 by William Ryan, James

A. Walker and Fred W. Bentley, and may be addressed in care of the latter at 106 North LaSalle Street.

The Joliet Wrought Washer Company, Joliet, Ill., has let contracts for a new building, 80 x 220 ft., to take the place of the one recently destroyed by fire.

The Moline Flow Company, Moline, Ill., has awarded the contract for its new one-story machine shop, 100 x 300 ft., to cost \$50,000.

The Chicago Insulated Wire & Mfg. Company, Sycamore, Ill., will build a factory, 50 x 300 ft., to cost \$50,000. H. F. Boardman, 53 West Jackson Boulevard, Chicago, is manager.

John Green & Son, Hooperston, Ill., operating a machine shop and foundry, specializing in repair work, have incorporated with a capital of \$20,000.

The Wilson Stove Company, Metropolis, Ill., is completing its new factory and expects to be in operation about March 1.

The Grimm Balance Valve Company, Decatur, Ill., has been organized with a capital of \$5,000 by S. J. and C. W. Diets and C. V. Grimm.

A controlling interest in the Reynolds Pattern & Machine Company, Moline, Ill., manufacturer of an automatic feed power screw driver, has been acquired by Floyd Snyder and associates, Massillon, Ohio, who will remove the business to the latter city, where a new plant will be built. G. D. Reynolds will continue as manager.

The Adams Company, Dubuque, Iowa, manufacturer of foundry equipment, will build a two-story factory addition, 72 x 250 ft.

The Maytag Company, Newton, Iowa, maker of agricultural implements, has prepared plans for a new foundry, 90 x 100 ft., to cost \$25,000.

Catalogs Wanted

The western office of the Monarch Engineering Company of Kansas City, Mo., located at Denver, Col., J. A. Cook, purchasing agent, has just purchased the structural steel shop of the Lowith Iron Works in Denver and intends to equip it so it will have a capacity of 8000 tons per year. It is in the market for the following list of new or slightly used machinery, and solicits quotations for delivery at Denver, together with catalogs and descriptions of the equipment:

One pneumatic jaw squeezer, capacity up to $\frac{3}{4}$ -in. rivets in small-sized sections.

One air gun for small rivet work.

Wire bound air hose.

One turning lathe, 18-in. swing, 10-ft. bed, complete.

One 10 or 12-hp., three-phase induction motor.

One electric or air drop hammer for heavy forging, about a 1000-lb. hammer.

One milling machine for capacity 12-in. channel and plate, box columns or chords.

One set of bending rolls for 8-ft. plates, capacity $\frac{5}{8}$ or $\frac{1}{2}$ in. thick.

One combined punch or riveter for corrugated culvert pipe.

One set corrugated bending rolls 8 in. in diameter for culvert pipe.

Two industrial push cars and 600 ft. of 20-lb. to 30-lb. rails.

Punches and dies, and other small tools.

One electric spot welding machine.

One oxy-acetylene welding and cutting apparatus.

The Auto Truck Steel Body Company, Chicago, has purchased property at Carroll and Albany avenues, 100 x 225 ft., on which it is erecting a one and two-story building, to cost about \$25,000.

The Burlington & South Chicago Terminal Railroad Company, Chicago, has been incorporated with a capital of \$1,500,000 by Hale Hoden, Edward M. Shelton and Harry E. Byron. The object of the company is to construct a railroad from a point on the Belt Railway Company's line near 100th Street to the southern limits of the city.

Indianapolis

INDIANAPOLIS, IND., Feb. 26, 1917.

The Drew Electric & Mfg. Company, Indianapolis, has increased its capital stock from \$35,000 to \$50,000.

The Automatic Control Company, Indianapolis, has been incorporated with \$200,000 capital stock to manufacture automatic devices. The directors are Edward Stiegelmeyer, William H. Mohs and Lewis C. Wiese.

The Allison Experimental Company, Indianapolis, has been incorporated with \$10,000 capital stock to manufacture machinery. The directors are Everett F. McCoy, Quincy A. Myers and Edward E. Gates.

The Farmers & Merchants Light & Power Company, LaGrange, Ind., has been authorized to sell \$500,000 stock to buy and improve six small water power plants.

The Board of Public Works, Richmond, Ind., has authorized improvements to the municipal light and power plant to cost \$50,000. Two 500-hp. boilers are included.

The Hoover Mfg. Company, Anderson, Ind., has been incorporated with \$10,000 capital stock to manufacture lathes and other machinery. The directors are Edward M. Hoover, Jesse H. Mellett and Edward J. Burke.

The Reynolds Gas Regulator Company, Anderson, Ind., has been incorporated with \$60,000 capital stock to manufacture gas regulators, valves, gages, etc. The directors are Miron G. Reynolds, Jacob C. Groble and C. B. Reynolds.

The Lavelle Foundry Company, Anderson, Ind., has purchased the property of the Crystal Ice Company, including a two-story building, and will double the capacity of its plant.

The Lowell Truck Company, Lowell, Ind., has been organized to manufacture motor vehicles and accessories. The directors are Carlos A. Kenney, Thomas Grant and Leslie H. Geist.

The Martin Band Instrument Company, Elkhart, Ind., has increased its capital stock from \$30,000 to \$235,000.

The Champion File Renewing Company, Middletown, Ind., has been incorporated with \$10,000 capital stock to renew old files. The directors are Albert W. Smith, William P. Lovett and Lester H. Trout.

The Brazil Motors Company, Brazil, Ind., has been organized and has bought the plant of the old Brazil Fence Company. It will manufacture a truck with a front axle drive.

The Automatic Farm Implement Company, Elkhart, Ind., has been incorporated with \$50,000 capital stock to manufacture farm implements and machinery. The directors are John G. Schacht, Claude E. Jackson and Ernest A. Skinner.

The Fort Wayne Rolling Mill Company, Fort Wayne, Ind., has increased its capital stock from \$100,000 to \$300,000.

The Sieffert Electric Company, Evansville, Ind., has increased its capital stock from \$20,000 to \$30,000.

The Kokomo Water Works Company, Kokomo, Ind., has increased its capital stock from \$195,000 to \$325,000.

The Jackson Shovel & Tool Works, Hartford City, Ind., has been sold to Hubbard & Co., Pittsburgh, for \$40,000. It is said it is the intention of the new owners to double the capacity of the plant.

The George P. Wagner Company, Jasper, Ind., has been incorporated with \$40,000 capital stock to manufacture farm machinery. The directors are George P., M. L. and Alfred Wagner.

A 200-ft. brick building, part of the Central Foundry Company, Fort Wayne, Ind., collapsed when a sewer beneath it caved in. The damage is estimated at \$15,000.

The Automobile Dump Car Company, South Bend, Ind., has been incorporated with a capital of \$25,000 by P. C. Fergus, M. L. Petro and A. L. Herr.

The Studebaker Corporation, South Bend, Ind., has completed the plans for a continuous gray iron foundry, 140 x 450 ft., with an equipment of three cupolas. A forge shop, 160 x 200 ft., will also be built.

Cincinnati

CINCINNATI, OHIO, Feb. 26, 1917.

Manufacturers of automobile and auto-truck tires have been taking quite a number of machines lately for making tire molds. Chief among these are boring and turning mills. While railroad buying of machine tools has not been very heavy in the past few days, considerable business is being quietly negotiated that has not come to light. Present purchases are being made at prevailing prices on all machines, and it is predicted, on account of the increasing costs of castings and other machine-tool parts, that further advances are to be expected. The export business is not in a very satisfactory shape due to the railroad situation. Several firms also report shipments that are held up in New York. A few scattered orders have been received from the Pacific coast recently for portable electric drilling machines. The local coal shortage has been relieved and all plants are operating on full time.

The H. W. Roos Company, Cincinnati, has been incorporated with \$100,000 capital stock by H. W. Roos and others to manufacture a self-locking shoring device used in concrete construction. Temporary quarters have been secured at 2824 Stanton Avenue.

D. Meinken, contractor, Cincinnati, has been awarded contract for an addition to the plant of the United States Playing Card Company, Norwood, Ohio.

Plans are under way by the city of Hamilton, Ohio, for making additions to the municipal lighting plant.

The Smith Gas Engineering Company, Lexington, Ohio, contemplates establishing a plant in Dayton, Ohio, for the manufacture of producer gas equipment. A foundry will be operated in connection with the plant.

Further information as to the building plans of the Dayton Rubber Mfg. Company, Dayton, Ohio, gives the size of the main building as 150 x 500 ft., one story, of reinforced concrete. The power plant will be in a separate structure. Work will be commenced as soon as the architects' plans are completed.

Plans are being prepared for rebuilding the plant of the American Mechanical Toy Company, Dayton, Ohio, recently destroyed by fire. It is probable a more commodious location will be selected. F. A. Wagner is president.

It is currently reported that the Joyce-Cridland Company, Dayton, Ohio, maker of hydraulic jacks, intends to increase the capacity of its plant.

The Duriron Casting Company, Dayton, Ohio, suffered a fire loss last week estimated at \$20,000. Rebuilding operations were begun immediately and the damaged portions of the foundry are expected to be in operation within the next few days. It is rumored that the company intends to build an entirely new plant. P. D. Schenck is president.

Contract for the proposed addition to the plant of the O. S. Kelly Company, Springfield, Ohio, has been awarded to the Blanchard Building Company, Dayton, Ohio. It will be 200 x 250 ft., one story, of monitor type.

The Trump Mfg. Company, Springfield, Ohio, contemplates increasing the capacity of its plant, and if the move is carried out traveling cranes and other equipment will be required.

Work will be commenced at an early date on remodeling the plant of the Victor Rubber Company, Springfield, Ohio. Considerable new equipment will be required.

The Columbus Railway, Power & Light Company, Columbus, Ohio, has secured a site nearby on which it intends erecting a generating plant, estimated to cost with the equipment over \$1,000,000.

The daily press reports that the Newark Casting Company, Newark, Ohio, is contemplating removing its plant to Circleville, Ohio. Official confirmation is lacking at present.

The Robbins & Myers Company, Springfield, Ohio, maker of electrical equipment, has increased its capital stock from \$1,000,000 to \$5,000,000 and will add to its manufacturing facilities.

The Automatic Incubator Company, Delaware, Ohio, has been incorporated with \$10,000 capital stock by William McKenzie and others, to manufacture a patented incubator.

The Regent Foundry Company, Marysville, Ohio, is a new organization that will operate the brass foundry of the former Regle Brass Foundry Company. Arrangements have been made for doubling the capacity of the plant. George Fisher is president.

The W. E. Lamneck Company, Columbus, Ohio, is erecting an addition to its present plant, 120 x 135 ft., two stories, of reinforced concrete. The company will not only make a specialty of furnace fittings, as well as complete furnaces, but will also fabricate and install dust-collecting systems. Charles J. Holub, who was for 16 years with the Excelsior Steel Furnace Company and for the past eight years with the Williamson Heater Company, has accepted the position of general superintendent.

The daily press reports that the Jaeger Machine Company and the Standard Chain Company, Columbus, Ohio, will soon have plans prepared for new plants to be located above the flood stage.

The Columbus Belting & Supply Company, Columbus, Ohio, sustained a fire loss last week estimated at \$3,000. Deliveries will not be seriously affected.

The National Chain Company, Marietta, Ohio, has been incorporated with \$150,000 capital stock by Frank Bond and others. It already has a plant completed that it expects to have in full operation at an early date.

The Ortman Motor Company, Washington Court House, Ohio, has acquired more commodious quarters and will add to its repair shop equipment.

It is reported that W. F. Bippus and J. M. Switzer have taken over the plant of the Joyce-Cridland Company, Frankfort, Ohio, manufacturer of hoisting machinery. The plant will be enlarged.

The Standard Electric Tool Company, 128 Opera Place, Cincinnati, expects to increase its capital stock from \$15,000 to \$40,000 to take care of its increasing business.

The Cincinnati Frog & Switch Company, Oakley-Cincinnati, contemplates making some warehouse additions to its plant.

Milwaukee

MILWAUKEE, WIS., Feb. 26, 1917.

New business continues to come in large volume to local machine-tool builders, who report that it is almost impossible to hope to catch up with deliveries under the present conditions. The railroad freight situation still is acutely unfavorable and shipments the past week have been rather small. The relief of crowded warehouses has been only slight. Promises of an improvement in the car supply and movement are, however, being made. Up to this moment this has affected only the necessities of life. Carload shipments are practically out of the question, but it is not so difficult to get room for break-bulk, and inasmuch as the general run of orders is for single tools or small lots, manufacturers say that matters could be much worse. The scarcity of cars has brought a serious shortage of coal and many plants have used all of their motor truck equipment to keep their bins supplied.

The coming of milder weather has brought to notice numerous new projects, mainly shop extensions, which furnish an even more insistent demand for machine-tools than that encountered the last few months. The labor situation is quiet, but it is believed that the machinists will again attempt to force their demand for an 8-hr. day about May 1. The State employment bureau in Milwaukee reports that there is likely to be a shortage of unskilled labor within 30 or 60 days, because of the small immigration movement. The shortage already is evident and is considered the most unusual ever known for this time of the year.

The Standard Steel Company, Milwaukee, has been incorporated with a capital stock of \$50,000 and will establish a plant there for the manufacture of steel farm and stable equipment, concrete mixers, sanitary indoor toilets and other goods. The company will absorb the Abbotsford Mfg. Company, Abbotsford, Wis. Plans are being prepared for a two-story shop building, 60 x 200 ft. and a foundry, 60 x 200 ft. Edward J. DeGuenther, 701 Merrill Building, Milwaukee, is president.

The Charles W. Fish Lumber Company, Birnamwood, Wis., will build a saw and planing mill at Antigo, Wis., to cost about \$50,000.

The Rice Lake Motor Car Company, Rice Lake, Wis., is spending about \$5,000 for new tool equipment for its machine shop, which now is under the management of John McFarland, Milwaukee.

The American Chair Company, Sheboygan, Wis., will build a four-story addition, 75 x 180 ft., this spring.

W. J. Fitzgerald, Beloit, Wis., has taken the general contract for erecting an eight-story brick and concrete addition, 100 x 256 ft., for Farley & Loetscher, Dubuque, Iowa, makers of interior woodwork. The improvement will cost \$250,000.

The Marshfield Aerator Company started operations Feb. 15 in its new plant and is now engaged in a regular production of dairy and farm machines. Michael Duvall is chief engineer.

The E. H. Karrer Company, 278 West Water Street, Milwaukee, maker of surgical instruments and supplies, has increased its capital stock to \$50,000 upon taking occupancy of its new plant.

The Kawalle Brothers Company, Manitowoc, Wis., manufacturing chain drive motor boats, manumotors and similar products, has been reorganized as the Manumotors Company with a capital stock of \$20,000. It is planning to erect a machine shop and foundry, but has not yet completed details.

The Joerns Brothers Mfg. Company, Sheboygan, Wis., manufacturer of hardwood products, furniture, etc., sustained a loss of more than \$100,000 in the destruction of its plant by fire last week. It is planned to rebuild if local capital will aid.

The Eastern Wisconsin Electric Company, Sheboygan, Wis., has been incorporated with a capital stock of \$7,000,000 by the Kelsey-Brewer interests, Grand Rapids, Mich. The new company is formed to take over the Sheboygan Electric Company, Sheboygan; the Eastern Wisconsin Railway & Light Company, Fond du Lac, Wis., and the Wisconsin Traction Company, Oshkosh, Wis.

The Oneida Motor Truck Company, Green Bay, Wis., has been incorporated with a capital stock of \$300,000 to manufacture motor trucks and parts. The incorporators are Mitchell Joannes, J. H. Taylor, F. E. Burrall, J. C. Fogarty, and several other business men of Green Bay. Although details are not divulged, it is reported that the company is organized to bring to Green Bay the Menominee Motor Truck Company of Menominee, Mich.

William Hardy, Union Grove, Wis., owner of the local electric light and power plant, has sold it to the Wisconsin Gas & Electric Company, Racine, Wis. The plant, which was

damaged by fire, will be rebuilt and a new oil engine unit installed.

P. E. Keller, formerly manager of the pattern department of the Wisconsin Aluminum Foundry Company, Manitowoc, Wis., will establish a pattern shop in Milwaukee about April 1.

Paul F. Koshollek, Stevens Point, Wis., is planning to manufacture an improved four-wheel drive and steering unit for automobiles and motor trucks, upon which he has been granted letters patent. Models are being manufactured by local shops under contract for the present.

The Wisconsin Cabinet & Panel Company, New London, Wis., will spend between \$150,000 and \$200,000 for new buildings and equipment, both wood and metal-working. A bond issue of \$200,000 has been filed.

The Wisconsin Motor Mfg. Company, Milwaukee, at its annual meeting, declared a stock dividend of 100 per cent, in addition to the regular cash dividends, and to accomplish this voted to increase the capital stock from \$350,000 to \$1,000,000. The new issue will consist of \$300,000 of 7 per cent preferred and the remainder common. It is proposed to enlarge the works in the coming six months so that the present capacity will be about doubled. The company is one of the largest manufacturers of internal combustion engines in the United States. Its specializes in automobile, motor truck, tractor and aviation engines. Charles H. John is president and general manager.

C. H. Swartzlow, Juda, Wis., will build and equip an electric light and power plant, steam-operated, to cost about \$7,500.

Cleveland

CLEVELAND, OHIO, Feb. 26, 1917.

Three Ohio companies making munitions have finished their contracts and the past few days placed their equipment on the market, which consists of about 500 machines, lathes predominating. Some of this equipment, at least, is being offered for sale at the present time because of high prices prevailing for machine tools. Possibly new orders can be secured to keep the plants busy for a time, but the owners feel that should they delay disposing of this machinery they might have to take considerably lower prices. The volume of sales has been somewhat quiete the past few days, but inquiries are still very numerous, coming from scattered sources and mostly for one or two machines. One Ohio inquiry is for about 45 machine tools, including 20 lathes and 10 milling machines. One local machine house reports that it has quotations out on about \$100,000 worth of machinery, the bulk of these made in response to inquiries for small lots of machines. It is announced that the Kelly-Springfield Tire Company, Akron, Ohio, which recently sent out a large list of machine tools, will probably defer purchasing for about six months.

The Monarch Brass Company, Cleveland, maker of plumbers' brass goods, has acquired a site on East Forty-fifth Street and is having plans prepared for a new plant which it contemplates building shortly.

The Taylor Machine Company, 7804 Carnegie Avenue, Cleveland, has been incorporated with a capital stock of \$70,000 and in addition to jobbing work and building special machinery will manufacture lathes, having purchased the business of the Cleveland Lathe & Machinery Company. William W. Taylor and others are interested.

The Toledo Tap & Die Company, Toledo, Ohio, has been incorporated with a capital stock of \$50,000 and will establish a plant in a new two-story factory at Clinton Street and Oakwood Avenue, for the manufacture of taps and dies. Robert L. Ellery of the Toledo Drill & Tool Company, will be president and Robert M. Ellery, sales manager. The Toledo Drill & Tool Company will occupy one floor of the same building.

The American Mfg. & Sales Company, Toledo, has been incorporated with a capital stock of \$50,000 and will establish a plant to manufacture lighting regulators and other automobile accessories. C. J. Horn and others are active in the enterprise.

The plant of the Hill-Cheesman Mfg. Company, Toledo, manufacturer of go-carts and other vehicles for children, will be consolidated with the Hill-Standard Mfg. Company, Anderson, Ind., and will move to the latter place, where a new company has been incorporated under the name of the Hill Standard Company, with a capital stock of \$600,000. A new two-story factory will be erected.

The Biltwell Tire & Rubber Company, Akron, is having plans prepared for a three-story factory, 60 x 200 ft.

The Banner Foundry Company, Akron, has taken out a permit for a new foundry at 216 Newton Street.

The Automatic Incubator Company, Delaware, Ohio, has been incorporated with a capital stock of \$10,000 and will

build a plant to manufacture incubators. William McKenzie is president.

The Canton Axle Mfg. Company, Canton, Ohio, will rebuild, as soon as possible, its forging department which was recently badly damaged by fire.

The Bonnot Company, Canton, has increased its capital stock from \$100,000 to \$500,000, necessitated by the growth of its business. No extensions are contemplated at present.

The Collier Motor Truck Company has moved its plant from Painesville to Sandusky, Ohio. Some of the interests represented in this company are also associated with the new Sandusky Forge Company. Until quarters are secured the Motor Truck Company will use part of the Forge Company's plant.

The Jewel Cast Iron Company, West Lafayette, Ohio, is being formed to manufacture a line of gas flat irons formerly made by the Sailor-Melvin Company, Massillon, Ohio. The latter plant will be moved to West Lafayette. W. W. Dyser and others are interested.

The East Iron & Machine Company, Lima, Ohio, has increased its capital stock from \$125,000 to \$400,000 to take care of contemplated extensions.

The Lorain County Electric Company, Lorain, Ohio, will shortly begin the erection of a light and power plant.

Detroit

DETROIT, MICH., Feb. 26, 1917.

The general tone of the machinery market has improved materially the past week and many inquiries have been received, especially for wood-working and miscellaneous machines. The freight congestion has been greatly relieved and embargoes in this district have been removed. Coal also is coming into the city in large amounts for the first time in several months, and manufacturers will soon be working on a normal basis. As a result dealers expect the market will grow stronger. Several large companies are anticipating increase in equipment, but are refusing to place definite orders until general conditions become more normal.

The plant of Harroun Motors Corporation, Wayne, Mich., has been rushed to completion and machinery will be ordered forwarded March 1.

The Oliver Instrument Company, Detroit, has completed arrangements to move its plant to Adrian, Mich., where it will continue its machine shop and nickel-plating work.

The American Specialties Products Company, Detroit, has been incorporated with a capital stock of \$10,000. Nathan J. Gardner, Harrison C. Beebe and Alois A. Deimel are the stockholders.

The Scharf Tag Company, manufacturer of paper tags and labels, has removed from Ypsilanti to Grand Rapids, Mich., where it will double its capacity. P. E. Madden is secretary and manager.

The Waddell Mfg. Company, Detroit, has incorporated for \$100,000 to manufacture wood furnishings. The stockholders are John Waddell and Edward J. and E. L. Aldworth.

The River Raisin Paper Company, Monroe, Mich., has absorbed the G. H. Wood Paper Company at a consideration of \$1,050,000. The new capitalization will be \$2,500,000.

The Ow-Ron Regulator Company, Detroit, has incorporated for \$50,000 to manufacture water feed regulators, engines, etc. The stockholders are Michael Owen, Maurice Ronayne and E. O. Wolf.

The Michigan Copper & Brass Company, Detroit, has passed from the control of those formerly active in the management to a group of men closely identified with the motor interests with which W. C. Durant is identified. The new officers are D. M. Ireland, president; James T. Whitehead, first vice-president; Hal. H. Smith, second vice-president; Alfred L. Simmons, secretary, and John L. Connell, treasurer. David Burgess is superintendent.

The Tronovost Torsion Spring Wheel Company, Plymouth, Mich., has made arrangements for a site for its new plant on the Pere Marquette tracks.

The C. R. Wilson Body Company, Detroit, has taken the plant of the Hargreaves Mfg. Company, 60 West Eighteenth Street, together with one or two other plants which will be obtained, and will manufacture closed bodies, demountable tops, sedans, etc.

The Wolverine Tractor Company, organized to manufacture heavy farm tractors, has acquired the use of 119 acres of land at Inkster, Mich., outside of Detroit. William G. Waenals is president.

The Janney Aircraft Company, Monroe, Mich., has been incorporated to manufacture aircraft. The company has a capital stock of \$30,000 and takes over the property of E. Lloyd Janney, Toronto.

The H. L. & W. Sales & Mfg. Company, Detroit, has incorporated for \$50,000 to manufacture machinery and automobile accessories. The stockholders are S. H. Humphrey, Detroit; A. C. Leverton, Highland Park, Mich., and A. B. Willem, Jackson, Mich.

The National Brass Company, Grand Rapids, Mich., has increased its capital stock from \$200,000 to \$275,000.

The Brooks Mfg. Company, Saginaw, Mich., has increased its capital stock from \$150,000 to \$200,000.

The Superior Steel Casting Company, Benton Harbor, Mich., will erect a foundry extension, 140 x 142 ft., and will be in the market for a 10-ton electric traveling crane, two 250-hp. motors, an electric furnace and an air compressor. It is stated that in the near future a two-story pattern and office building, 50 x 100 ft., and a unit power house will also be built.

The Weis Mfg. Company, Monroe, Mich., will build a four-story addition to its plant, 90 x 140 ft., to cost \$50,000 and to be completed about Aug. 1.

The Central South

LOUISVILLE, KY., Feb. 26, 1917.

Machinery trades in Kentucky are giving their support to the proposed new State tax laws which would exempt machinery and raw materials for manufacturing from local taxation with a view to encouraging industrial development of the State. A special session of the Legislature is considering reform legislation and prospects are for its adoption.

Manufacturers who have been engaged in producing distillery apparatus are turning to the manufacture of denatured alcohol plants, milk-handling equipment, etc.

The Louisville Auto Supply Company, Louisville, Ky., has increased its capital from \$25,000 to \$50,000.

Beecher & Fowler, Louisville, Ky., manufacturers of metal dies, etc., are re-establishing their plant in a building at Fourth and Main streets, Louisville, installing new equipment.

Fire Feb. 22 destroyed the plant of the Tompkinsville Electric Light & Ice Company, Tompkinsville, Ky., with a loss estimated at \$8,000. J. B. Brown, manager, is making arrangements for temporary service and will rebuild.

The Barbourville Supply Company, Barbourville, Ky., is in the market for a small electric generator.

The electric light and power plant of J. E. Kelly, Walton, Ky., has been destroyed by fire with a loss of \$5,000. He will immediately replace it.

The White Oak Lumber Company, Ashland, Ky., has been incorporated by E. P. Rice, S. E. Harmon, J. F. Hager, and others, with a capital of \$200,000.

The Bay City Coaster Company, Catlettsburg, Ky., has been incorporated with capital stock of \$24,000 to manufacture railway coasters and other amusement devices, by E. J. Lauterbach, D. H. Putnam and W. M. Pritchard.

The Ken-Tenn-Va Log & Tie Company, Winchester, Ky., has been incorporated with capital stock of \$10,000 by H. C. Woolf and C. E. Cofer and M. J. Cofer of Pineville, Ky.

The Clark County Motor Car Company, Winchester, Ky., will remodel and equip a garage with an estimated outlay of over \$5,000.

The Barbourville Supply Company, Barbourville, Ky., is in the market for a new or second-hand belt-driven air compressor with a capacity of 200 to 250 cu. ft. per minute.

The Van Winkle Motor Truck Company, Atlanta, Ga., will incorporate in Tennessee with \$50,000 capital stock and establish a plant in Chattanooga.

The William Slater Electric Company, Memphis, Tenn., has been incorporated with capitalization of \$10,000 by William Slater, Yenti Slater, T. H. Jackson, and others.

The Eugene Polk Motor Company, Memphis, Tenn., has been incorporated with capital stock of \$10,000 by R. M. Foster, R. M. Foster, Jr., Eugene Polk, and others.

The Wall-Morrison Mfg. Company, Covington, Tenn., has increased its capital from \$2,000 to \$20,000 and changed its name to the Covington Mfg. & Auto Company.

Texas

AUSTIN, TEX., Feb. 24, 1917.

The demand for small tools continues unusually active. Irrigation pumping machinery is also selling well in the more arid parts of the State. In view of the prospect of the large increase in the cotton acreage this season a big demand for cotton ginning, compressing and cotton seed oil mill machinery is looked for.

The El Paso Refining Company, El Paso, will double the

capacity of its electrolytic-oxygen plant and will install machinery for grinding and pressing cotton seed. The proposed improvements will cost about \$100,000.

The Nome Gin & Milling Company, Nome, will build a cotton gin to cost \$5,000. S. H. Holmes is a stockholder.

The Texas Brush Mfg. Company, Fort Worth, which has a capital stock of \$10,000, will install a plant.

Higgins has issued \$20,000 in bonds for the construction of a waterworks plant.

St. Louis

ST. LOUIS, Mo., Feb. 26, 1917.

Quiet but steady buying on a broad scale has been characteristic of the machine-tool market the past week. The aggregate of business is holding up very satisfactorily and dealers anticipate a much sharper demand upon the elimination of uncertainty as to war situation. Shipping conditions continue to have some influence on business, but some relief in the car shortage has been effected, though the embargoes are still on.

The Double Eccentric Piston Ring Corporation, St. Louis, has been incorporated with a capital stock of \$70,000 by William H. Baumann, Walter E. Kech and Frank W. Wagner to manufacture piston rings, etc.

The Kerosene Motor & Tractor Company, St. Louis, has been incorporated with a capital stock of \$10,000 by George P. Weber, James M. Leonard and G. C. Weber to manufacture motor vehicles and trucks.

The St. Louis Ventilating & Sheet Metal Company, 3327 Locust Street, St. Louis, A. J. Schmittner, president, is in the market for equipment for heating, ventilating and general sheet-metal work.

The Scharff-Koken Mfg. Company, St. Louis, has been incorporated with a capital stock of \$30,000 by Edward E. and Sidney N. Scharff, and Roy B. and William F. Koken to manufacture paper products.

Clyde B. Judd, Wainwright Building, St. Louis, is reported in the market for excelsior-making and power plant equipment.

Poplar Bluff, Mo., under the direction of the mayor, will expend about \$10,000 for new electric light plant equipment.

The Coal District Power Company, Fort Smith, Ark., Hugh Means, Lawrence, Kan., president, will develop plants to supply all towns in Sebastian county with electric light and power. The Albert Emanuel Company, Dayton, Ohio, is understood to control the concern.

The Brack-Foster Motor Car Company, Little Rock, Ark., has been incorporated with a capital stock of \$13,000 by E. O. Brack, A. W. Dobyns, and others, and will equip a machine shop and garage.

Wanette, Okla., has voted \$80,000 for an electric light and power system.

Watonga, Okla., is in the market for oil engines for its electric light plant. The mayor is in charge.

The Roxana Petroleum Company, Tulsa, Okla., has ordered plans for 400 miles of pipe-line extension with pumping stations. Sanderson & Porter, New York, are the engineers.

The Wabash Refining Company, Sand Springs, Okla., has been incorporated with a capital stock of \$500,000 by L. W. Baxter, C. E. King and John H. Winemiller, all of Tulsa.

The Tulsa Electric Shop, Tulsa, Okla., has been incorporated with a capital stock of \$10,000 by David Evans, G. E. Williams and R. L. Emmer to manufacture electrical appliances.

The Just Rite Mfg. Company, Oklahoma City, Okla., has been incorporated with a capital stock of \$15,000 by C. S. Yeaton, El Reno, Okla.; W. W. Beavers, Chickasha, and C. A. McCarthy, Colorado Springs, Col., and will equip a plant.

The Biloxi Shipyard & Box Factory Company, Biloxi, Miss., is reported in the market for about \$5,000 worth of equipment. Francis Brander is active in the enterprise.

The Mississippi Lumber Vulcanizing Corporation, chartered with \$300,000 capital by E. M. Pease, Port Chester, N. Y., and L. C. Wallace and S. F. Carlson, New York, it is reported will equip a plant in Mississippi.

Lecompte, La., will equip an electric light and power plant in connection with a waterworks plant. A 2300-volt, 60-cycle, three-phase system will be required. Bids are being received. F. P. Joseph, Glenmora, La., is engineer in charge.

The Marksville Electric Light & Ice Company, Marksville, La., has been incorporated, and in addition to its original purpose will also install ice-making equipment. E. M. Kursheedt is general manager.

Bernstein Brothers, Shreveport, La., will equip a garage and repair plant to cost about \$55,000 complete.

The Pacific Northwest

PORTLAND, ORE., Feb. 20, 1917.

The extreme scarcity of materials is holding up a good deal of work, shipbuilding being especially affected. The scarcity of steel plates is curtailing the building of steel vessels and is causing an increase in the demand for wooden vessels. Engine manufacturers complain of trouble in obtaining shafting, especially billets for forging large crank shafts. Some important railroad projects are now coming up and a good deal is being planned in the way of hydroelectric development.

The iron works of the Northwest report a large volume of orders for saw and shingle-mill equipment, signifying extensive preparations for the season of lumbering activities, which is expected to begin immediately upon relief from the car situation. Repair work has been heavy and the plants are also loaded up with orders for small equipment and machinery for the numerous shipbuilding plants.

The car shortage in the Pacific Northwest is growing more disastrous every day. Lumber mills are seriously crippled, stocks are piling up, some mills have been forced into bankruptcy, and more than 30 have been forced to close. All plants report their order files full and are now refusing further orders. It is estimated that the unshipped balance of orders for rail shipment now held by mills amounts to 387,575,000 ft.

Plans for the Great Northern Railroad terminals at Leavenworth, Wash., include the erection of a reinforced concrete 32-stall roundhouse, a machine shop and other buildings.

Details are expected soon on a hydroelectric plant to be erected by the Chicago, Milwaukee & St. Paul Railroad at Priest Rapids, Wash., on the Columbia River.

The Oregon Short Line Railroad is planning considerable extensions at its repair and machine shops at Pocatello, Idaho.

T. E. Ripley, president of the Wheeler-Osgood Company, announces that the company will erect a new 1800-hp. steam power plant on the tidelands at Tacoma, Wash., at a cost of between \$30,000 and \$40,000. A battery of four boilers will be installed.

The Spokane Valley Power Company, following authorization by the Washington Legislature, will install a 25,000-hp. hydroelectric plant on the Fort Target Range.

Daniel Kern of the Columbia Contract Company, and John Kiernan, both of Portland, Ore., plan the establishment of a shipyard between Market and Mills streets. The first vessel to be built will be 230 ft. long, with 1000-hp. engines.

Sumner K. Prescott, formerly a member of the Fred M. Prescott Steam Pump Company, Milwaukee, and later of the Prescott Company, Menominee, Mich., has organized the Sumner K. Prescott Company, Seattle, Wash., to manufacture farm and general utility tractors. The company has purchased the foundry and machine shop of the Westerman Iron Works, Seattle, which has a capacity of 10 to 12 tons daily. The plant will be operated as a commercial foundry in addition to producing complete tractors.

A new company capitalized at \$100,000, known as the Western Shipbuilding Corporation, has been organized to take over the plant of the People's Shipbuilding & Construction Company, now under construction at Gig Harbor, Wash. The new company plans to build a much larger plant than that now under way and has contracts for a number of large schooners. It has also purchased the plant of the Wright Repair Company, Tacoma, in order to secure the necessary machinery to fit up a ship repair plant for the new yards. A. B. Gellerman, Tacoma, is president and G. C. Lemcke, Seattle, is secretary.

The Doud-McFarlane Machinery Company, Tacoma, Wash., has recently added a galvanizing plant, which will be operated in connection with the manufacture of marine hardware and ship chandlery. A new building will be constructed to house this portion of the plant. The company reports more work on hand than ever.

The Rings Novelty Company, Mount Vernon, Wash., has recently established a factory for the manufacture of automatic calculators. C. R. Rings is president.

The American Packing Company, Everett, Wash., is expending \$20,000 in the construction of a can factory in connection with its fish-packing plant. The plant will ultimately be extended to supply cans for the general market.

Work of rebuilding the Kratz Shingle Company's mill at Clatskanie, Ore., recently destroyed by fire, will begin at once. The plant will have three uprights and one hand machine, with a capacity of 200,000 ft. per day.

The Pacific Lead Products Company, Spokane, Wash., plans to place in operation its lead plant near Spokane. About \$30,000 will be expended in improvements and better-

ments to the plant, and is also planned to later double the capacity of the plant, which was erected at a cost of \$200,000.

The land industrial department of the Alaska Engineering Commission has leased for 20 years a tract of land at Seward, Alaska, to the San Juan Fish Company, Seattle, as a site for a salmon cannery, cold-storage plant and dock. The terms of the lease provide that the company expend \$100,000 this year in improvements. H. O. Roberts is the Seward representative of the company.

The Atlas Foundry & Machinery Company, Tacoma, Wash., plans the erection of a foundry and pattern shop, 40 x 225 ft. It has recently purchased additional land at its plant and will erect foundry and machine shop buildings this year to cost \$50,000.

The Port of Astoria Commission, Astoria, Ore., has rejected all bids for supplying dredging machinery.

Work has been started on the shipyards of the Todd Shipbuilding & Drydock Company at Tacoma, Wash.

The American Tool Mfg. Company, Portland, Ore., has increased its capital stock to \$50,000.

The Sloan Shipyards Corporation, Seattle, Wash., has let contracts for its dock, slips and railway at Olympia, Wash.

The Pacific Steel & Boiler Company, Tacoma, Wash., has increased its capital stock to \$150,000.

The Miller-Parker Company, Portland, Ore., will erect a three-story fireproof garage and machine shop at a cost of \$17,000.

The Kincaid Machinery Company, Colfax, Wash., has secured a permit for the erection of an addition 50 x 50 ft.

Canada

TORONTO, ONT., Feb. 26, 1917.

The new plant of the British Cordite Company, to be built at Parry Sound, Ont., by the Canadian Explosives, Ltd., for the Imperial Munitions Board, will probably be the largest work of its kind in Canada. Orders for the material and equipment are being placed by the Canadian Explosives, Ltd., Montreal.

The Exolon Company, Thorold, Ont., manufacturer of abrasive refractory materials and ferrosilicon, has commenced the erection of an addition to its plant and will install equipment so as to increase the production by 100 per cent.

The Canada Furniture Company, Wiarton, Ont., whose plant was recently destroyed by fire with a loss of \$80,000, will erect a new factory.

The plant of the Queen City Foundry, Ashbridges Bay, Toronto, was totally destroyed by fire Feb. 19 with a loss of \$65,000. The loss to machinery, equipment, patterns, etc., will amount to \$50,000.

Malcolm Blue, North Slope, Springhill, N. S., is in the market for steam water pumps, fans, cables, drums, hauling outfit, tracks, etc., for mining.

The Quaker Oats Company, 34 Hunter Street, Peterboro, Ont., will spend \$100,000 on additions and new equipment for the plant it recently acquired at London, Ont. A quantity of machinery will be required.

The Riordon Pulp & Paper Company is making preparations for the erection of a sulphite plant at Haileybury, Ont. Surveys of a site for a 500-ton mill are now being carried out, and it is proposed to have the first unit of 100 tons ready by January, 1918.

John A. Moody, London, Ont., is in the market for power metal stamping machines.

The Verity Plow Company's cupola house at Brampton, Ont., was destroyed by fire with a loss of \$10,000.

The F. E. Combe Furniture Company, Ltd., Kincardine, Ont., is in the market for a 60 to 100-hp. stationary engine.

The British Chemical Company has extended its plant. It has purchased a block of land in Trenton, Ont., and has awarded the contract to Fraser, Brace & Co., Montreal, for the erection of between 30 and 40 buildings for a smokeless powder plant.

Construction work has been started on the rebuilding of the Dickson Bridge Company's plant at Campbellford, Ont., destroyed by fire a few weeks ago. It is reported that the National Mfg. Company, Ottawa, has purchased a controlling interest, but that the firm name will be unchanged. New machinery will be required. A. H. McKeel is superintendent for the erection of the plant.

Ground has been broken for the new plant of Aeroplanes, Ltd., on Dufferin Street, Toronto, to cost \$500,000.

Robert Rogers, Minister of Public Works, Ottawa, has announced that a new contract has been prepared for the St. John, N. B., harbor works, and that tenders will be called

for immediately. The Norton-Griffith Company had failed to carry out the original contract after spending upward of \$1,000,000 on the work.

Edmonton, Alberta, is making preparations to install a sewage disposal plant to have a capacity of 5,000,000 gal. per day and to cost \$600,000.

The Ladysmith Smelter Corporation, Ladysmith, B. C., intends to spend \$100,000 on additions to its present plant. W. J. Watson is superintendent.

Duclos & Payan, St. Hyacinthe, Que., will build a two-story factory for the manufacture of leather goods, etc. Ross & MacDonald, 1 Belmont Street, Montreal, are the architects.

Work has been started on the clearing away of the debris of the steel plant at Sherbrooke, Que., owned by MacKinnon Holmes & Co., Ltd., Drummond Street, recently destroyed by fire. The company will rebuild its plant at a cost of \$40,000, and will purchase a considerable amount of new machinery. F. A. Johnston is secretary and treasurer.

W. H. Gibson, 11432 Seventy-ninth Street, Edmonton, Alberta, will erect a lumber mill to cost \$18,000, and is in the market for two boilers of 100 and 150 hp., two engines, two high-speed planers, an electric light plant, etc.

The Page Hersey Iron Tube & Lead Company, Ltd., Guelph, Ont., has awarded the contract for the erection of an addition to its plant to cost \$3,500.

The A. F. Byers Company, Ltd., 340 University Street, Montreal, has been awarded contract for a plant for the manufacture of sheet iron, metal ware, galvanized and copper ware, etc., by the Thomas Davidson Mfg. Company, Montreal. Prices are being asked for a three-ton Scotch derrick and one 55-ft. boom.

The Canadian Cereal Company, Tillsonburg, Ont., proposes to install complete electrical equipment to operate its mills. Mr. Kennedy is manager.

The City Council, Winnipeg, Man., proposes to enlarge the Point du Bois power plant to 100,000 hp., at a cost of \$150,000. Alderman Sparling is chairman of the electrical department.

The factory at St. Catharines, Ont., occupied by the Meyercord Sign Company and the Muller-Flower Electric Repairs Company, was destroyed by fire with a loss of \$50,000.

The head office of the Dominion Chain Company has been changed from Montreal to Niagara Falls, Ont.

The Federal Steel & Foundry Company proposes to erect a steel plant and rolling mill at Coburg, Ont., to cost \$250,000. T. H. Cole, Owen Sound, Ont., is active in the enterprise.

The International Malleable Iron Company, Beverley Street, Guelph, Ont., proposes to erect a foundry at a cost of \$15,000.

The Imperial Munitions Board, Ottawa, Ont., has decided to establish a munitions assembling plant in London, Ont., and has secured a factory there.

George Trudell will convert the old traction company's power house in Chelsea Green, London, Ont., into a plant for refining and smelting metals, etc.

The Superior Electrics, Ltd., Pembroke, Ont., has been incorporated with a capital stock of \$100,000 by John H. Reeves, Leonard S. Mackie, James R. Lockhart and others to manufacture electric machinery, etc.

The National Piano Company, Ltd., Toronto, Ont., has been incorporated with a capital stock of \$1,000,000 by Alexander Mullin, 31 Woolawn Avenue; William D. Toye, 82 Beverley Road, and others.

The Aspinwall Canadian Company, Ltd., Guelph, Ont., has been incorporated with a capital stock of \$75,000 by Laurence Jacques and Dott Watt of Guelph, Ont.; Pardon G. Van Vleet, 40 Springhurst Avenue, Toronto, and others, to manufacture machinery, tools, implements, etc.

The Ford Tractor Company of Canada, Ltd., Toronto, has been incorporated with a capital stock of \$10,000,000. The provisional directors are Elizabeth Knox, Harry G. Keen, 486 Marion Avenue; John F. Boland, 2 Toronto Street, and others of Toronto.

La Samaritaine, Ltd., Montreal, has been incorporated with a capital stock of \$50,000 by Zoel Parent, Georges S. de Ber, Joseph O. Toutant and others to deal in machinery, tools, etc.

The Paint Products Company of Canada, Ltd., Montreal, has been incorporated with a capital stock of \$500,000 by John B. D. Legare, Armand Mathieu, Robert T. Mullin and others.

It is reported the Canadian Pacific Railway Company plans the early construction of car shops near Port Coquitlam, B. C. It is now constructing 25 locomotives in its shops at Angus, B. C.

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